



## GE Silicones

### Preliminary Product Data Sheet D1-SEA 210 Silicone Elastomeric Adhesive

#### PRODUCT DESCRIPTION

GE Silicones D1-SEA 210 is a two-component, silicone elastomeric adhesive which offers fast, deep-section cure. Uncured, it is a thixotropic paste. This paste quickly cures to a durable and resilient silicone rubber at room temperature with primerless adhesion to many substrates.

The thixotropic paste consistency of D1-SEA 210 makes it appropriate for application to vertical and overhead surfaces. This consistency also facilitates fixturing small parts in place while the adhesive cures.

#### KEY PERFORMANCE PROPERTIES

- Fast room temperature cure
- Two-component for controlled cure rate and deep-section cure
- Primerless adhesion to many substrates
- Low odor
- Non-corrosive to metals
- Low temperature flexibility
- High temperature performance
- Excellent weatherability, ozone, and chemical resistance
- Excellent electrical insulation properties

#### APPLICATIONS

D1-SEA 210 is intended to be suitable for applications requiring either a fast cure, a deep-section cure, or a more controlled cure speed.

Representative applications include the adhesion of dissimilar materials for automotive headlamps; assembly of mechanical components for automotive airbags; and use as a gasketing material for the steam chambers of household irons.

D1-SEA210 is appropriate for consideration for use in electronic and electrical applications where a non-corrosive adhesive is required.

TYPICAL PRODUCT DATA (1)			
Uncured Property	D1-SEA 210A	D1-SEA 210B	D1-SEA 213B
Consistency	Thixotropic Paste	Thixotropic Paste	Thixotropic Paste
Color	Ivory	Light Black	Dark Black
Specific Gravity	1.41	1.035	1.10

Mixed Properties	D1-SEA 210
Parts by weight D1-SEA 210A to Parts by weight D1-SEA 210B or D1-SEA 213B	100:8
Initial Application Rate, g/min (2)	120
Tack-Free Time, minutes	35
Gel Time, minutes	35

Color D1-SEA210A/D1SEA210B Gray  
D1-SEA210A/D1-SEA213B Black

#### Cured Properties (3)

Mechanical:	
Hardness, Shore A	37
Tensile Strength, kg/cm <sup>2</sup> (psi)	20.7 (295)
Elongation, %	255
Shear Strength, kg/cm <sup>2</sup> (psi)(4)	13.7 (195)

Thermal:	
Continuous temperature	-45°C to 125°C
Operating range, °C (°F)	(-50°F to 260°F)

- (1) Based upon laboratory results only  
 (2) 0.125" I.D. nozzle at 50 psi pressure  
 (3) 7 day cure at 77°F/50% R.H.  
 (4) 1" x 1" x 0.030" specimen of polycarbonate at 100% cohesive failure

#### SPECIFICATIONS

Typical product data values should not be used as specifications. Assistance and specifications are available by contacting GE Silicones at (800) 255-8886.

#### INSTRUCTIONS FOR USE

##### Surface Preparation

GE Silicones D1-SEA 210 will bond to many clean surfaces without the aid of a primer. These surfaces typically include many metals, glass, ceramics, and many plastics not containing fugitive plasticizers, which can migrate to the surface impairing adhesion. An evaluation should be made to determine bond strength for each specific application. For difficult-to-bond substrates, the use of a primer or special surface preparation technique is recommended. GE Primer SS4004, SS4044, and SS4179 can be evaluated. Complete information and usage instructions for these primer products are contained in product data sheet #1532.

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Flame and corona etching have been found to be successful as a surface preparation for plastic substrates in some applications. In the areas where adhesion is required, surfaces should be thoroughly cleaned with a suitable solvent such as isopropanol or methyl ethyl ketone (MEK) to remove dirt, oil and grease. The surface should be wiped dry before applying the adhesive sealant.

When solvents are used, proper precautions must be observed.

### Packaging and Dispensing

#### Mixing

D1-SEA210 is packaged in containers sized to a standard mix ratio of 100 parts D1-SEA210A to 8 parts, by weight, of either D1-SEA210B or D1-SEA213B. This ratio can be varied from a high of 100:10 to a low of 100:6. Changes in the ratio will have an impact on catalyzed work life, fixture time and cure time. Increasing the ratio from the standard 100:8 will speed the reaction, while decreasing the ratio will slow the reaction. Within the recommended catalyst range there may be a small amount of variation in adhesion and final physical properties.

D1-SEA210 can be mixed either by hand or with automated equipment. When mixing by hand, measure out the appropriate amounts of D1-SEA210A and either D1-SEA210B or D1-SEA213B into a clean and dry mixing container. With clean tools, thoroughly mix the two components, scraping the sides and bottom of the container carefully to produce a homogeneous mixture. When properly mixed, the material should be a solid, homogeneous color (gray when using D1-SEA210B and black when using D1-SEA213B), free of any swirling or marbling of colors. When using power mixers, avoid excessive speeds which could entrap large amounts of air or cause overheating of the mixture, resulting in a shorter work life.

D1-SEA210A is ideally suited for use in automated meter/mixing dispensing equipment. These automatic systems can precisely meter appropriate ratios of each component and deliver either a continuous flow or a measured shot size of thoroughly mixed material. This type of equipment is highly recommended for use in high volume continuous production environments. Specific details on dispensing systems and manufacturers are available in a separate RTV Silicone Rubber Equipment Guide (GE Silicones Publication #CDS-1758).

D1-SEA210B & D1-SEA213B are sensitive to prolonged exposure to atmospheric moisture. Their storage containers should be kept closed whenever possible to maximize their useful life. D1-SEA210B & D1-SEA213B may separate during storage, but may be easily remixed by hand prior to use. Continuous agitation of the "B" component is recommended when using automated meter/mixing equipment.

When solvents are used, proper precautions must be observed.

#### Curing

D1-SEA210, when mixed with either D1-SEA210B or D1-SEA213B at the standard by-weight-ratio of 100:8, will have a typical tack-free time of about 35 minutes at ambient conditions

of 77°F (25°C) / 50%RH. Under these conditions, the fixture time will be approximately 1 hour. Complete cure will usually be seen within 24 hours (1/4" thickness). Maximum properties will normally be achieved within 7 days.

D1-SEA210, as a two component product, is designed for deep-section cure (greater than 6mm / 0.25" cross-sections). As the adhesive cures, alcohol vapors are released from the product. This by-product of the curing reaction has a slight but non-objectionable odor which will diminish as the cure progresses. This cure by-product should be allowed to dissipate completely (approximately 24 hours for 1/4" thickness) prior to totally enclosing the material. D1-SEA210's cure rate will be accelerated during high humidity conditions. Mild heat (i.e. below 49°C/120°F) will shorten the work-life and fixture time of the product, but will not significantly reduce the time required for a complete cure.

#### Adhesion

Development of maximum bond strength will depend on joint configuration, adhesive thickness and substrate preparation. Normally, sufficient bond strength will develop within one hour to permit handling of the parts. Minimum stress should be applied to the adhesive bond for 24 hours. The adhesive strength of the bond will eventually exceed the cohesive strength of the silicone rubber adhesive. Maximum strength should be reached within 7 days.

#### Clean Up and Removal

For uncatalyzed or uncured mixed material, solvent systems such as naphtha or methyl ethyl ketone (MEK) are most effective for cleanup. When solvents are used, proper precautions must be observed.

After cure, selected chemical strippers which will remove the silicone rubber are available from other manufacturers. Specific product information may be obtained from a GE Silicones Customer Service Specialist at (800)332-3390.

### HANDLING AND SAFETY

Material Safety Data Sheets are available upon request from GE Silicones. Similar information for solvents and other chemicals used with GE products should be obtained from your suppliers.

### STORAGE WARRANTY PERIOD

The warranty period is 6 months from the date of shipment from GE Silicones if stored in the original unopened container at 27°C (80°F) for D1-SEA210A and at a temperature below -18°C (0°F) for D1-SEA210B and D1-SEA213B.

#### AVAILABILITY

D1-SEA 210 may be ordered from GE Silicones, Waterford, NY 12188, the GE Silicones Sales office nearest you or where appropriate, an authorized GE Silicones product distributor.

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## GOVERNMENT REQUIREMENT

Prior to considering use of a GE Silicones product in fulfilling any government requirement, contact GE Silicones Customer Service department to determine if all government requirements can be met.

## PRELIMINARY DATA SHEET DISCLAIMER

The product described in this preliminary data sheet is not a standard commercial product. GE Silicones does not have an adequate statistical basis for establishing manufacturing standards and process control parameters. As a result, this product may not become a standard commercial product and the product properties and application information appearing in this preliminary data sheet may not accurately reflect product properties and application information for a product which may become generally available as a standard commercial product. A GE Silicones technical marketing representative can provide assistance and guidance on product use, formulation alternatives, if any, and expected performance characteristics based on the limited information presently available.

## LIMITED WARRANTY

GE Silicones warrants that its product will conform to GE Silicones' internal specifications at the time of application or use, provided that the product is stored in accordance with GE Silicones' recommendations and used or applied before the earliest of (1) the "Use Before Date" indicated on the product package, (2) one year from date of shipment, or (3) expiration of such other period or recommended storage time stated in the GE Silicones' literature for the product. If notified in writing of a claim within six months of the product's use or application, GE Silicones will, at its option, replace or refund the purchase price of any GE Silicones product which does not satisfy the foregoing warranty.

THE FOREGOING SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDY FOR DEFECTS OR FAILURE OF THE PRODUCT, AND THE SOLE AND EXCLUSIVE LIABILITY OF GE. THE WARRANTIES STATED ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

**LIMITATION OF LIABILITY:** GE shall in no event, whether the claim is based on warranty, contract, tort, strict liability, negligence or otherwise, be liable for incidental or consequential damages, or for any other damages in excess of the amount of the purchase price.

**NOTE:** For many products, GE Silicones may be able to offer a more extensive, application specific warranty. For further information, contact your GE Silicones field representative.



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**United States Patent** [19][11] **Patent Number:** **5,839,982****Hying et al.**[45] **Date of Patent:** **Nov. 24, 1998**

[54] **STEEL FRAMED BASKETBALL  
BACKBOARD WITH PLASTIC RETAINER  
AND METHOD OF MAKING SAME**

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[21] Appl. No.: **742,873**

[22] Filed: **Nov. 1, 1996**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 593,321, Jan. 31, 1996,  
abandoned.

[51] **Int. Cl.<sup>6</sup>** ..... **A63B 63/08**

[52] **U.S. CL.** ..... **473/481**

[58] **Field of Search** ..... 473/474, 481,  
473/482

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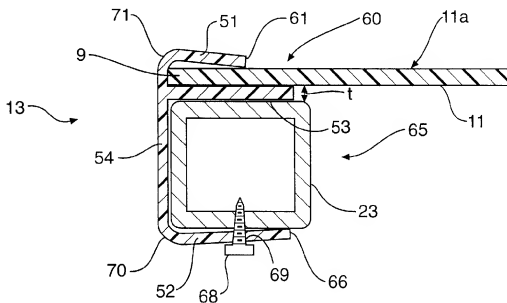
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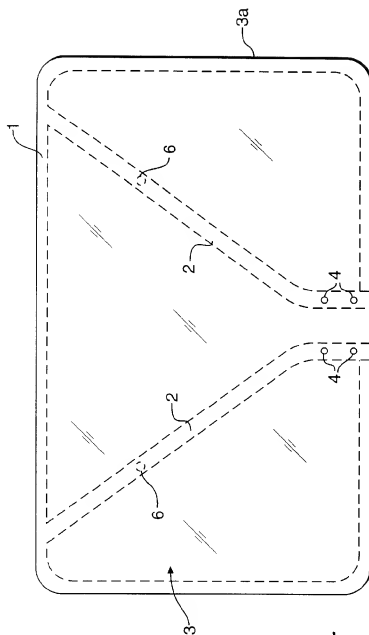
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*Primary Examiner*—Ralcigh W. Chiu  
*Attorney, Agent, or Firm*—Michael J. Bell; Howrey &  
Simon

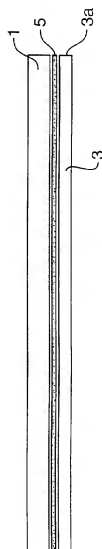
[57] **ABSTRACT**

A basketball backboard assembly for supporting a rebound member having a tubular steel frame and one or more plastic channels connecting the rebound member to the frame in a manner that protects the edge of the rebound member. The steel frame includes an outer section preferably formed from a single piece of tubular steel and an inner section welded to the outer section. The plastic channel includes a first slot which receives the peripheral edge of the rebound member and a second slot which receives a portion of the outer section of the frame.

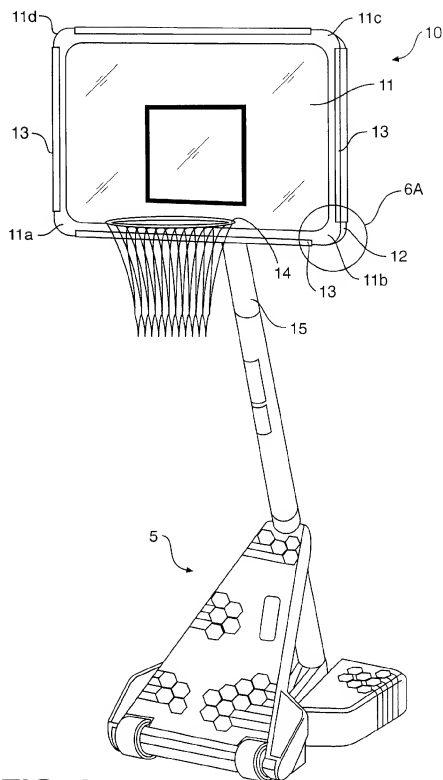
**43 Claims, 14 Drawing Sheets**



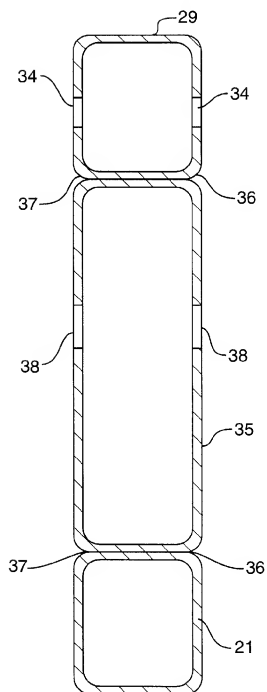
**FIG. 1**  
PRIOR ART



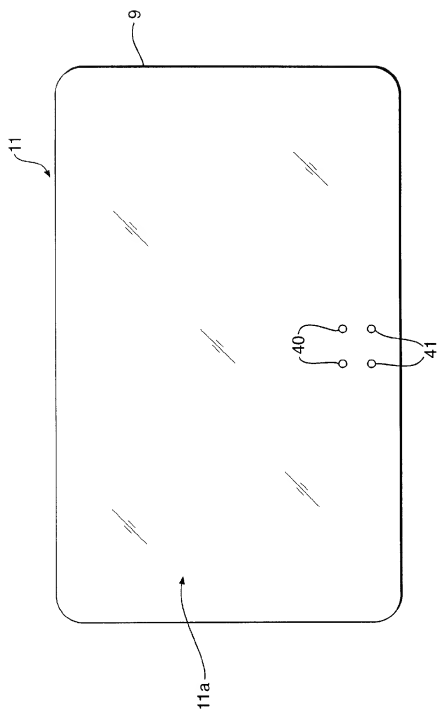
**FIG. 2**  
PRIOR ART

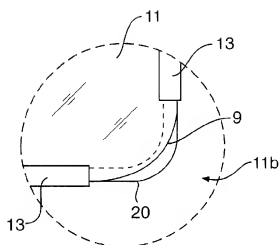
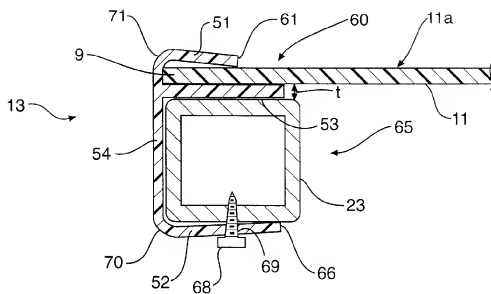
**FIG. 3**

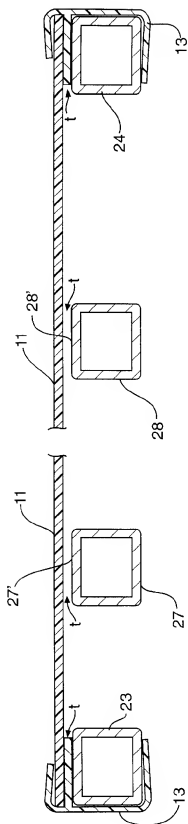


**FIG. 5**



**FIG. 6**

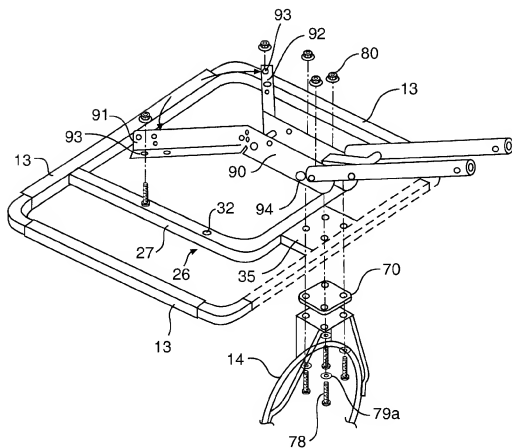
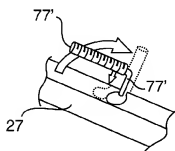
**FIG. 6A****FIG. 7**

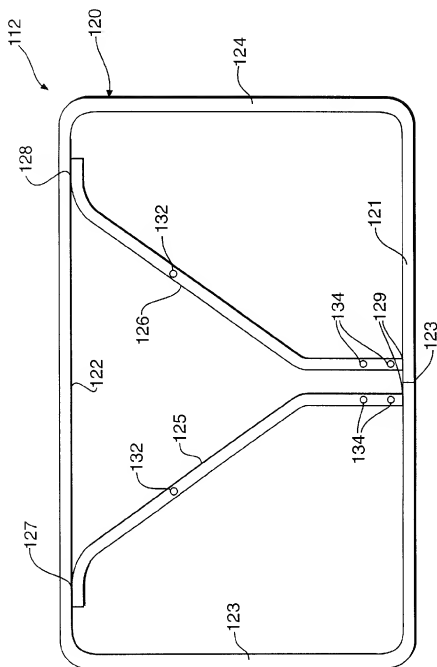


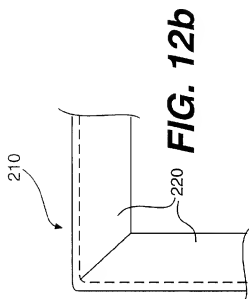
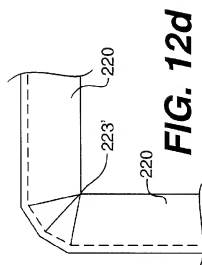
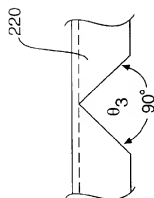
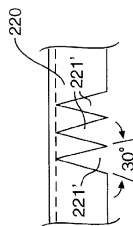
**FIG. 7A**

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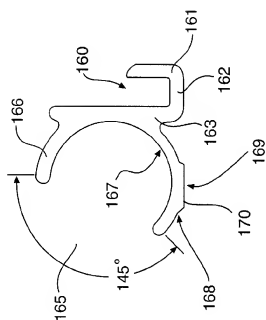
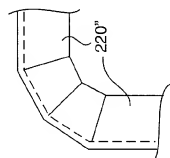
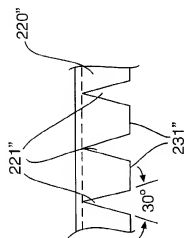


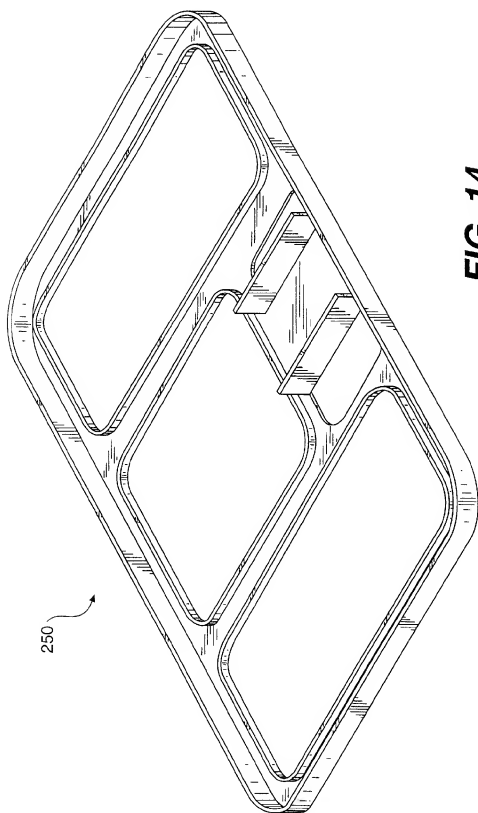
**FIG. 10****FIG. 10A**

**FIG. 11**

**FIG. 12b****FIG. 12d****FIG. 12a****FIG. 12c**



**FIG. 13****FIG. 12f****FIG. 12e**

**FIG. 14**

# STEEL FRAMED BASKETBALL BACKBOARD WITH PLASTIC RETAINER AND METHOD OF MAKING SAME

## RELATED APPLICATION

This application is a continuation-in-part of copending application Ser. No. 08/593,321, filed Jan. 31, 1996 now abandoned.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates generally to basketball backboards and, in particular, to a basketball backboard having an extruded plastic member supporting a rebound member on a frame to which a basketball goal and backboard support system may be attached.

### 2. Description of Related Art

Basketball backboards are currently made from a variety of materials. Typically, basketball backboards have been provided with a steel or aluminum extruded frame formed from individual sections that are joined to form a support for a backboard rebound member. The frame not only supports the rebound member, but includes holes or the like to facilitate mounting the backboard to a support structure, such as an extension arm or elevator, and a support post. The rebound member has been formed from a plastic material, commonly acrylic. A disadvantage associated with many basketball backboards is that the peripheral edge of the rebound member may be exposed, thereby increasing the risk of cracking when the edge is struck by a basketball or other object.

In one known prior backboard developed by the assignee of this application, the backboard frame comprises four substantially straight extruded aluminum members each having an "I"-shaped cross section defining a pair of parallel flanges and four diecast corner members. The frame members are aligned to wrap around the edge of the backboard with the flanges extending along opposing sides of the backboard and the extruded members connected to the corner members by a fastener. In forming the extruded frame member, the spacing of the flanges must be sufficient to accommodate any tolerance variations in the thickness of the backboard rebound surface. Thus, it is possible for gaps or a loose fit to occur between the existing frame structure and the backboard surface resulting in variations in the amount of rigidity and/or support provided by the frame. The backboard is mounted to a support structure through openings in two of the frame members. The frame members have an open slot extending along the length of each member. At a predetermined position along the slot, an enlarged portion is formed for receiving the head of a mounting bolt associated with the support structure. The head of the bolt is retained within the cross section of the frame, but is slidable along substantially the full length of the support structure during assembly.

Further, the assembly of the above-described backboard structure requires that the frame and backboard surface be moved toward each other in a sideways direction such that the frame is essentially wrapped around the backboard surface during assembly. Thus, assembly of the prior backboard requires that the edge of the backboard surface be aligned with a slot defined between the parallel flanges as the backboard is brought into association with the frame.

Although this multi-piece frame structure has worked well from the standpoint of providing a rigid support for

rebounding a basketball, it has certain disadvantages, especially from the standpoint of ease of manufacturing and assembly. In particular, alignment of the eight frame pieces with the rebound member prior to interconnection is a labor-intensive process. Moreover, the use of aluminum to form the frame members is costly. Finally, allowing the backboard support mounting bolts used to slide the entire length of the frame member may make attachment to a support structure difficult.

FIG. 1 schematically illustrates another known basketball backboard construction, which includes a welded steel frame 1 having diagonal supports 2 and a substantially planar acrylic sheet 3. As shown in the simplified side view of FIG. 2, which obviously is not to scale, a rectangular acrylic sheet 3 is attached to frame 1 by a double-sided adhesive layer 5. The sheet 3 has an outer perimeter edge 3a, which is completely exposed at all four sides of the sheet. A basketball goal may be mounted to frame 1 by way of holes 4 located through diagonal supports 2. The basketball backboard is attached to a support structure by way of mounting apertures 6 located on diagonal supports 2. The mounting apertures are threaded inserts, which receive a bolt or similar fastener from the support structure.

This type of frame construction suffers from more drawbacks and disadvantages than the aluminum extruded backboard described above. Most notably, is the use of adhesive material, which may not be strong enough to retain the acrylic sheet against the frame for an extended period. Thus, the rebound member may not be sufficiently supported by the backboard frame, thereby decreasing rebounding performance. Additionally, the entire edge of the acrylic sheet is exposed and, therefore, highly susceptible to cracking when the edge is struck by a ball or other object. Once a crack exists, it may propagate throughout the acrylic sheet and compromise the integrity of the backboard assembly. In addition, broken pieces of acrylic can fall from the supporting frame thereby exposing a player to injury. Another disadvantage is the bolt mounting structure. The threaded insert design does not accommodate for variations in the thickness of the particular mounting and support structure employed. Therefore it requires the precise size bolt to successfully attach the backboard to its support. Also, prior to the invention described herein backboards utilizing steel frames have been costly to manufacture and possess excessive weight, thereby increasing the requirements for the backboard support assembly, shipping costs, etc.

In the backboard assembly disclosed in the parent application, a molded plastic frame supports a rebound member having a rebound surface. The frame includes a front and a rear section, which is made by injection molding or with gas assist in combination with a strength-enhancing technique like structurally foaming or fiberglass-reinforcing the plastic. The rebound member is supported between the front and rear frame sections which completely encapsulate the peripheral edge of the rebound member.

Even though molded plastic frame backboards made according to the parent application work well and have achieved commercial success, there is a need for a backboard that performs comparably from the standpoint of rebound characteristics and durability, yet costs less and is easy to manufacture and assemble, while at the same time avoiding the problems of the prior art backboard designs.

## SUMMARY OF THE INVENTION

The invention meets these needs and avoids the disadvantages and drawbacks of the above-described prior art by

providing a basketball backboard assembly having a tubular steel frame for supporting a rebound member having a rebound surface. One or more preferably extruded plastic retainers connected to the frame supports rebound member on the frame in a manner that encapsulates its peripheral edge substantially or completely.

The tubular frame of the invention may be formed separately and is defined by an outer and inner frame sections preferably welded together. The outer section may be formed from a single piece of tubular steel bent and welded together to form a desired backboard support shape, such as the generally rectangular shapes with rounded corners illustrated herein. The inner section preferably is also made from tubular steel welded to the outer section to enhance the strength and rigidity of the outer section. The frame includes apertures or similar structure for mounting the backboard assembly to conventional support systems known in the art. The mounting apertures do not extend through the entire cross-section of the frame thereby preventing mounting fasteners positioned in the apertures from coming into contact with the rebound member. The frame also includes additional apertures or similar structure for mounting a basketball goal thereto.

The rebound member of the invention has a peripheral edge and a substantially planar rebound surface as is conventional in the art. The rebound member is preferably formed from a molded plastic material, typically a polycarbonate or acrylic. However, the invention also enables other types of materials to be used for the rebound member, including wood, fiberglass, laminate, tempered glass and metal, although the maximum benefits of the invention may not be achieved with such materials.

The plastic retainer of the invention may be formed as one or several pieces of plastic from any known thermoplastic, such as polyvinylchloride (PVC), which preferably is extruded into the shape of a channel having a generally E-shaped cross-section forming first and second slots. The first slot receives the tubular frame and the second slot receives the peripheral edge of the rebound member, each preferably with an interference fit. The plastic retainer may be formed of several pieces disposed around the perimeter of the tubular frame, or as a single piece connected to the entire perimeter to encapsulate substantially all of the entire peripheral edge of the rebound member, respectively. In either case, the plastic retainer reduces the amount of exposed surfaces at the edge of the rebound member to reduce susceptibility to cracking. By providing support at the peripheral edge of the rebound member, the plastic retainer provides substantially unobstructed access to the rebound surface of the rebound member. The plastic retainer may be detachably connected to the frame by an interference fit in the second slot and/or by suitable fasteners.

The invention thus enables the backboard assembly to be relatively lightweight, durable and less costly than either molded plastic frames or extruded aluminum frames, while maintaining or surpassing the performance of prior art backboards. By encapsulating at least a significant portion of the rebound member within the plastic retainer, cracking and damage to the rebound member is significantly reduced or eliminated. Moreover, even if cracking does occur, the broken pieces should be trapped within the assembly due to this encapsulation feature. The plastic retainer provides a small clearance space between the rebound member and the frame which allows the rebound member to flex controllably across its surface when an object such as a basketball is thrown against the backboard assembly, thereby permitting the assembly to withstand greater impact forces.

These and other advantages of the invention will be apparent from consideration of the detailed description of the invention and accompanying drawings described below.

#### DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view schematically illustrating a prior art backboard.

FIG. 2 is an enlarged simplified, elevational view illustrating a side of the prior art backboard shown in FIG. 1.

FIG. 3 is a perspective view illustrating a backboard assembly constructed according to the principles of the invention in which a rebound member is supported on a steel frame by a series of plastic channel members.

FIG. 4 is a rear plan view of the frame shown in FIG. 3.

FIG. 5 is a cross sectional view taken along lines 5—5 of FIG. 4 illustrating the tubular construction of the frame and support plate.

FIG. 6 is a front plan view of the rebound member shown in FIG. 3.

FIG. 6A is an exploded view of a corner portion 11d of the backboard assembly shown in FIG. 3.

FIG. 7 is a cross sectional view of the plastic channel member of the invention illustrating how the rebound member is connected to the frame by the channel member.

FIG. 7A is a simplified cross-sectional view of the rebound member, plastic channel and a portion of the inner frame section illustrating the controlled flexure of the rebound member.

FIG. 8 is a rear perspective view schematically illustrating how the backboard assembly of the invention may be assembled with a basketball goal and mounted to a pole, roof, or wall support structure.

FIG. 8A is an exploded view of the insertion of an angled bolt into a vertical beam of the backboard assembly shown in FIG. 8.

FIG. 9 is a rear perspective view schematically illustrating how the backboard assembly of the invention may be assembled with a basketball goal and mounted to a support arm and extension arms of a support structure.

FIG. 9A is an exploded view of the insertion of an angled bolt into a vertical beam of the backboard assembly shown in FIG. 9.

FIG. 10 is a rear perspective view schematically illustrating how the backboard assembly of the invention may be assembled with a basketball goal and mounted to an elevator mechanism of a support structure.

FIG. 10A is an exploded view of the insertion of an angled bolt into a vertical beam of the backboard assembly shown in FIG. 10.

FIG. 11 is a rear plan view illustrating an alternative embodiment of the frame of the invention.

FIGS. 12a-f illustrate various embodiments in which the peripheral edge of the rebound member may be completely encapsulated by the plastic channel member of the invention. More specifically:

FIGS. 12a-b are partial front views illustrating a notched corner section of a first alternative embodiment of the plastic channel member of the invention.

FIGS. 12c-d are partial front views illustrating a notched corner section of a second alternative embodiment of the plastic channel member.

FIGS. 12e-f are partial views illustrating a notched corner section of a third alternative embodiment of the plastic channel member.

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FIG. 13 is a cross sectional view of an alternative embodiment of the plastic channel member of the invention configured to receive a rounded frame section.

FIG. 14 is a rear perspective view of another alternative embodiment of a frame of the invention.

#### DETAILED DESCRIPTION

Referring first to FIG. 3, the principles of the invention are illustrated in this simplified view of a backboard assembly 10, which generally includes a rebound member 11 supported on a frame 12 by a plurality of plastic channel members 13 connected to the outer perimeter of the frame. As will be more apparent from the drawings and detailed description below, the plastic channel members 13 encapsulate substantially all of the peripheral edge of the rebound member 11, leaving only the four small curved corner portions 11a-d exposed. Although the frame and rebound member are shown as having a generally rectangular shape, other shapes known in the art such as fan-shapes may be employed. A basketball goal 14 usually in the form of a metal rim and hanging net may be mounted to the backboard assembly 10 in a conventional manner. The goal may be formed as a breakaway goal that pivots downwardly in response to application of a predetermined force. An example of a particularly advantageous breakaway goal that may be mounted to the backboard assembly of the invention is described in the assignee's allowed, pending patent application Ser. No. 08/282,521, the disclosure of which is incorporated by reference herein. The net may be detachably mounted to the rim by use of a breakaway net attachment system, such as that described in the assignee's U.S. Pat. No. 5,524,883, the disclosure of which also is incorporated by reference herein. The backboard assembly 10 may be mounted upon conventional support structures known in the art. FIG. 3 illustrates the backboard assembly mounted upon the pole 15 of a portable support system 5 constructed according to the assignee's U.S. Pat. No. 5,415,393, although the backboard assembly of the invention may be used with other known portable support systems as well.

Turning now to FIG. 4, a preferred embodiment of the frame 12 for supporting the rebound member is shown and includes outer and inner sections of tubular steel. The outer frame section 20 is formed into a generally rectangular shape defined by horizontal portions 21 and 22 and vertical portions 23 and 24 by bending a predetermined length of tubular steel stock in any conventional steel bending apparatus. After the piece of tubular steel is bent to the desired shape, its ends are preferably positioned approximately in the middle of horizontal portion 21 at a small gap from each other, as shown schematically at 25. Gap 25 allows for greater tolerances in the length of the outer section 20 during manufacturing. The cross section of the outer frame section 20 may be substantially square with dimensions of approximately 1"x1" and a wall thickness of approximately 0.049 inches being preferred, but other dimensions and thicknesses may be used as the skilled artisan will appreciate. The outer frame section 20 thus defines the outer perimeter of the backboard assembly 10. This frame embodiment is particularly suited for a backboard having a width of approximately 44 inches although other sizes may be employed as well.

The inner section 26 of frame 12 is formed from a generally U-shaped beam. Similar to the outer frame section 20, the beam preferably is also made from conventional stock of 1" square tubular steel, but a thickness of 0.065 inches is preferred. Again other dimensions and thicknesses may be used. Inner frame section 26 is formed into a

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generally U-shaped configuration defined by vertical portions 27 and 28 and horizontal portion 29 by conventional steel bending apparatus.

The horizontal portion 29 of the inner frame section 26 is connected to a support plate 35, preferably by upper welds shown schematically at 36, 37. As shown best in FIG. 5, the support plate 35 may also be formed from tubular steel stock that is connected to the lower horizontal portion 21 of outer frame section 20, near gap 25 preferably by lower welds shown schematically at 36, 37. Thus, the support plate 35 connects the outer and inner frame section 20 and 26 together to provide a substantially rigid, unitary frame capable of supporting a rebound member. In the 44" backboard frame embodiment, the plate 22 is approximately 1" wide by 3" in height, and has the same thickness as the outer frame sections, however, it is understood other suitable dimensions may be used. In addition, these dimensions would probably change depending upon the size of the frame, the length of the vertical beam portions 27 and 28 employed, etc.

The inner frame section 26 and support plate 35 may also be provided with suitable apertures or other structure to facilitate mounting of a basketball goal and backboard support system, such as a pole, elevator arm, wall mounting bracket, etc., as is known in the art. Examples of such mounting structures are shown in FIGS. 8-10 described subsequently. The vertical portions 27 and 28 include apertures 32 for receiving suitable fasteners for attaching the backboard assembly to a support structure. Each aperture 32 only extends through one of the walls of its vertical portion 27 or 28 to prevent the fasteners from extending through or coming into contact with the rebound member 11, as is described in more detail below. Horizontal portion 29 includes goal mounting apertures 34 for receiving bolts or similar fasteners used to mount a basketball goal to the frame 12 in a conventional manner. The support plate 35 also includes two apertures 38 used to mount a basketball goal to the frame. Unlike apertures 32, apertures 34 and 38 extend completely through the inner frame section 26 and support plate 35 (see FIG. 5) and cooperate with similar apertures formed in the rebound member 10 to mount the goal.

The rebound member 11 is a substantially planar sheet or substrate, generally of rectangular shape with rounded corners as illustrated in FIG. 6 which generally matches the contour and perimeter of frame 12. Rebound member 11 is preferably formed from a molded plastic, such as acrylic or polycarbonate. Acrylic is the preferred type of thermoplastic used in the invention and it may be clear or tinted; however, other planar substrates such as laminate, wood, aluminum or other extruded material, metal, and tempered glass also may be used. The front face 11a of the rebound member defines a rebound surface having sufficient rigidity when assembled with the extruded plastic member 13 and the frame 12 to rebound a basketball tossed against the backboard assembly 10. The front face 11a may also have graphics and other ornamental features thereon as illustrated with reference to FIG. 3. The thickness of rebound member 11 may vary depending upon the particular rebounding characteristics desired, as is well known in the art. In the particular embodiments described herein, the thickness may range from about 0.150 to about 0.180 inches with about 0.150" being preferred for a 44" backboard design and 0.177" being preferred for a 48" backboard design. However, different thicknesses may be used, but will be readily apparent to the skilled artisan, depending upon cost, particular rebounding performance, and durability characteristics described.

The rebound member has an outer peripheral edge portion 9 captured and supported by the plastic channel member, as

described in detail below. Goal mounting holes **40** and **41** are formed in the substrate and are located toward the lower portion of the rebound member for receiving conventional basketball goal mounting bolts or similar fastening structure. Mounting holes **40** align with holes **34** in horizontal member **29** of U-shaped inner frame section **26**. Similarly, mounting holes **41** align with holes **38** of support plate **22**. In this manner, only four goal mounting fasteners extend through the acrylic rebound member. Holes **40** and **41** may be larger in diameter than holes **34** and **38** in order to assist in aligning the holes in the rebound member and frame sections during assembly, as well as providing for manufacturing tolerances. In addition, the hole pattern may be shifted depending upon the desired location of the goal by moving holes **34** from the horizontal member **29** of U-shaped inner frame section **26** to the horizontal portion **21** of outer frame section **20**, or providing an additional set of holes therein, which would permit the goal to be mounted in an upper or lower position.

FIG. 7 shows an enlarged cross sectional view of the plastic channel member of the invention, which more clearly illustrates how the plastic channel member supports the rebound member **11** on a typical portion of frame **12**. The plastic channel member is preferably formed as a single piece of rigid extruded plastic made from exterior grade polyvinyl-chloride (PVC), which is compounded with stabilizers for protection against ultra-violet radiation as is well known in the art. The extruded plastic member may also be made with high impact resins to add strength to its structure, however this would have a corresponding increase in manufacturing costs.

The plastic is extruded into a channel preferably having a generally "L" shaped cross section defined by first and second spaced, outer flanges **51** and **52**, which extend outwardly from web portion **54** interconnecting the two outer flanges. An inner flange **53** also extends outwardly from web portion **54** at a position intermediate the outer flanges, but closer to first flange **51**. Slot **60** configured to receive the peripheral edge **9** of rebound member **11** is defined by outer flange **51**, inner flange **53** and the portion of web **54** extending therebetween. The slot **60** has a width approximately equal to the thickness of rebound member **11** such that an interference fit is created between the rebound member **11** and the plastic channel **13** when the peripheral edge portion **9** of the rebound member is received in slot **60**. The interference fit may be enhanced by angling the outer flange **51** toward inner flange **53** by angle  $\theta_1$ , which is preferably approximately  $15^\circ$ . As the peripheral edge portion **9** of rebound member **11** is positioned within slot **60**, the end portion **61** of outer flange **51** is deflected outwardly and therefore abuts the front face **11a** of rebound member **11** with increased force. The rebound member **11** is retained in slot **60** without the need for additional fastening structures such as holes in the rebound member, which can promote cracking. In this manner, the peripheral edge portion **9** of the rebound member is encapsulated by the plastic channel **13**.

Slot **65** configured to receive a portion of frame **12** is defined by outer flange **52**, inner flange **53** and the remaining, majority portion of web **54** extending between the flanges **52**, **53**. The width of slot **65**, i.e. distance between the flanges is approximately equal to the thickness of the frame such that an interference fit is created between the plastic channel and the frame where the frame portion, e.g., vertical frame portion **23** is received in slot **65**. Outer flange **52** may angle toward inner wall **53** by angle  $\theta_2$ , which is preferably approximately  $13^\circ$ . As the frame portion **23** is positioned in slot **65**, the end portion **66** of angled outer web **52** is deflected outwardly and therefore abuts against the

frame member with increased force, thereby enhancing the interference fit between the extruded plastic member and the frame member. The interference fit between the plastic channel and frame may be supplemented or replaced with a detachable connection, e.g. by use of a separate fastening structure, such as a self-tapping screw **68**, shown in phantom, which may be positioned in an alignment groove **69** formed in the channel **13**. Other fastening structures such as molded snaps and push-in fasteners may also be used. The screw **68** extends through outer web **52** and into frame member **23**. The alignment groove may extend the length of the plastic channel such that the fastening structure may be positioned anywhere along the alignment groove as desired. The outer corners of the extruded plastic channel are formed with rounded edges **70** and **71** to minimize user injury during handling.

The plastic channel **13** supports rebound member **11** on frame **12** at a designed clearance space "t," which preferably is approximately equal to the thickness of inner flange **53** that separates the rebound member from the frame. The relationship between clearance space "t" and the frame is illustrated in FIG. 7A, which is a simplified cross-sectional view of the rebound member **11**, plastic channel **13**, vertical frame members **23** and **24** and vertical beam portions **27** and **28**, but is obviously not drawn to scale. The peripheral edge **9** of rebound member **11** is secured to the plastic channel **13** by the interference fit in slot **60**. This interference fit limits the rebound member from flexing within slot **60** to the very small amount permitted by the flange **51**, which is inherently inflexible due to use of rigid plastic material like exterior grade PVC to make the channel **13**. However, the rebound member is not secured to the inner frame section **26**, particularly vertical beam portions **27** and **28**, which allows the rebound member some inward flexure toward the inner frame section. The amount of inward flexure of the rebound member is limited and controlled by the inner frame **26** to be approximately equal to the amount of clearance space "t." Similarly, the rebound member may also flex outward away from the inner frame section and is limited solely by the amount of flexibility inherent in the rebound member and the rigidity of the interference fit between the rebound member **11** and channel **13**. Thus, clearance space "t" allows the rebound member **11** to flex across its entire unsupported surface area when struck by a basketball, thereby providing greater impact resistance as compared to prior art backboards that bond acrylic sheets directly to the frame structure using double sided tapes or adhesives. Clearance space "t" may also be eliminated or reduced as desired by attaching a padding material, such as foamed inserts, to the surfaces **27** and **28** of vertical beams **27** and **28**, thereby decreasing lateral movement of the rebound member toward the frame while still permitting flexing of the rebound member across its entire unsupported surface area.

FIG. 6A shows an enlarged view of corner **11b** of the backboard assembly of FIG. 3, which more clearly illustrates how corners **11a**, **11b**, **11c** and **11d** of the backboard may be configured to reduce the possibility of damaging the peripheral edge of the rebound member during handling. The radius of curvature at corner **11b** of rebound member **11** is greater than the radius of curvature of outer frame section **20**. This larger radius provides a shallower rounded turn of the exposed portion of peripheral edge **9** of rebound member **11** between plastic channel members **13** such that the peripheral edge falls within the radius of curvature of the outer frame section **20** at the corner locations. In this manner, if a corner of the backboard assembly comes into contact with a hard surface, such as the ground during

installation or otherwise, the portion of the corner that actually touches the hard surface is limited to the outer frame section 20 thereby protecting the peripheral edge of the rebound member.

The backboard illustrated in FIG. 3-7 may be assembled advantageously as follows. After the frame 12 is formed by welding the outer frame section 20, inner frame section 26 and support plate 35 together as described above, the rebound member 11 is positioned on top of the front surface of the frame. Four plastic channels 13 are positioned around the perimeter of the backboard assembly as shown with reference to FIG. 3. The rebound member is then lifted away slightly from the frame to position the peripheral edge portion 9 of rebound member 11 into slot 60 in one of the four plastic channels 13. In addition, the channel is mounted upon one of the horizontal frame portions 21 and 22 and vertical frame portions 23 and 24 such that it is received into slot 65 of plastic channel 13. This is repeated until all four of the channels are connected to the frame portions and the peripheral edge portion received in slot 60 of each channel. In this manner, the front face 11a of rebound member 11 is substantially unobstructed by the plastic channels and frame sections to provide access to the rebound surface 11a. Each of the four plastic channels 13 may be further connected to each of their corresponding frame members by way of self-tapping screws or similar fasteners positioned in the alignment grounds. Substantially all of the peripheral edge 9 portions of rebound member 11 (except for the corner areas) are encapsulated within the channel members, thereby reducing the likelihood that cracks will form in the rebound member. The plastic channels also serve to reduce the weight of the backboard assembly when compared to conventional backboards, thereby facilitating use with portable support systems. Suitable equipment could be provided to automate the assembly steps described above.

FIGS. 8-10 schematically illustrate three different types of conventional mounting structures for supporting the backboard assembly of the invention. FIG. 8 illustrates how the backboard assembly may be connected to a pole, roof, or wall mounting structure 85. Frame 12 is substantially similar to the frame illustrated and described with reference to FIG. 4, however, it shows an alternative aperture arrangement in which support plate 35 includes four goal mounting apertures 71 instead of providing two on the inner frame section and two on the support plate. Mounting plate 70 may be disposed between the mounting portion of goal 14 and the support plate 35 to facilitate attaching the basketball goal 14 to the frame 12. Goal 14 is attached to the backboard assembly by way of mounting bolts 78, washers 79a and 79b nuts 80. The bolts 78 extend through the apertures in the goal, mounting plate 70 and support plate 35, which are aligned. The bolts 78 are connected to nuts 80 in a conventional manner. Mounting bracket 85, which may be connected to a vertical pole, garage roof or other support structure, attaches to U-shaped beam 26 by way of fasteners 77, washers 81 and nuts 82. As shown in FIG. 8A, fastener 77 may be an L-shaped angled bolt having a threaded portion 77. Aperture 32 does not extend completely through the cross section of vertical beams 27 and 28, and are configured to receive the unthreaded portion of the angled bolt. As the unthreaded portion is inserted into aperture 32, the fastener is then rotated in a downward direction, as referenced by arrow D, which forces the unthreaded portion upward into vertical beam 28. An angled alignment insert (not shown) may also be positioned in aperture 32 to restrict the lateral movement of the fastener while a nut is connected thereto. In this manner, fasteners 77 are prevented from coming into contact with the rebound member.

FIG. 9 illustrates how a support arm and extension arms may be connected to the backboard assembly of the invention. Backboard assembly 10 is attached to one end of a support arm 75, having another end connected to a support pole. The same apertures, bolts, and associated hardware used for attaching goal 14 to the backboard are used to attach the extension arm, backboard and goal together. Extension arms 76 (only one shown in FIG. 8) attach at one end to bolts 77 in U-shaped inner frame structure 26 and at its other end (not shown) to the support pole to assist in supporting the backboard assembly. FIG. 9A shows apertures 32 located in the upper portion of vertical beam 27 receiving angled bolt 77 in the same manner as described in FIG. 8A. The extension arms 76 are attached to the vertical beams by way of bolts 77 in a conventional manner.

FIG. 10 illustrates how the backboard assembly is connected to an elevator mounting structure which facilitates height adjustment in a manner known in the art. The elevator mounting structure includes a beam 90 having a pair of diagonally extending arms 91 and 92 having apertures 93 for receiving angled bolt fasteners 77 which extend from U-shaped inner frame section 26 in the same mount as the previous mounting embodiment. Goal 14 is connected to the elevator beam 90, by way of mounting bolts 78, which extend through apertures 94, washers 79a and nuts 80.

The above described mounting structures are illustrative of the various ways the backboard assembly of the invention may be supported. Other support systems may be used as well.

FIG. 11 shows an alternative embodiment of the invention utilizing a different frame configuration 112. This alternative embodiment is particularly suited for a backboard having a width size of approximately 48", although other sizes obviously may be employed. Frame 112 has an inner frame section that differs from the previously described inner frame section, which is formed from U-shaped frame 26 and support plate 35.

The inner section of frame 112 is formed from a pair of bent, diagonal beams 125 and 126, which preferably are also made from tubular steel of the same stock as outer frame section 120. The beams are disposed between and attached, preferably by welding to horizontal frame portions 121 and 122 of frame 120 at 127, 128, and 129, to form a generally "Y"-shaped inner support section for increasing the strength and rigidity of the frame. Apertures 132 in diagonal beams 125 and 126, receive angled fasteners for attaching the backboard assembly to a support structure, such as those described above with reference to FIGS. 8-10 without having the fasteners extend through the diagonal beams and contact the rebound member 11. The diagonal beams also have a relatively short straight section, which include apertures 134 for mounting a basketball goal to the frame 120 in a conventional manner.

The above described embodiments illustrate a backboard assembly having a substantially rectangular shape with rounded corners, in which four plastic channel members are attached to the perimeter of the substantially rectangular backboard assembly. More specifically, as shown best in FIG. 3, the plastic channels are attached to the straight vertical and horizontal sections of the frame, thereby encapsulating the straight sections of the peripheral edge portion of the rebound member while leaving the rebound member exposed solely at the corners.

Alternatively, a single channel may be provided that extends around the entire perimeter of the backboard assembly, including the rounded corners, thereby com-

pletely encapsulating the peripheral edge portion of the rebound member. In this embodiment, a single channel member having a length equal to the perimeter of the frame may be provided again, preferably by extruding rigid plastic material into a channel member as discussed above. The rigid plastic, however, must be shaped to fit the radius of curvature of the four corners of the backboard assembly. Two examples of how this may be accomplished are described below, however, any suitable method for wrapping the channel around and attaching it to the perimeter of the frame may be employed. The first method described with reference to FIGS. 12a-f involves providing notches in the flanges of the channel to facilitate bending of the channel to conform to the corners of the frame and rebound member. The number of notches corresponds to the size of the backboard and the desired curvature of the corner. For example, FIG. 12a, 12b illustrate a straight extruded plastic channel 210 having a cross section similar to that illustrated in FIG. 7 wherein a notch is formed through the flanges that define the slots receiving the frame and rebound member, although for simplicity only one of such notched flanges 220 is illustrated in FIGS. 12a-f. FIGS. 12a-12b show an embodiment in which a notch 221 forms an approximately 90° angle referenced at  $\Theta_3$ . The plastic channel member is then bent at the notched portion thereby creating the squared corner of FIG. 12b. As a second example, FIG. 12c illustrates a straight plastic channel member 220 wherein three separate notches 221' are formed at approximately 30° angles. The plastic channel is then bent about central point 223' thereby creating a somewhat rounded corner shown FIG. 12d. A third example is illustrated in FIG. 12e wherein three separate notches 221'', equally spaced apart by a distance 231'' are formed in the straight channel member 220' at approximately 30° angles. The channel member 220' is bent about the notched portions thereby creating the "octagonal-like" corner of FIG. 12f. As can be understood from the above description, the desired corner configuration may be achieved by increasing or decreasing the number of notches, altering the spacing between the notches, and changing the size of the angle of each notch formed in the extruded plastic member. Specifically, more notches in smaller degree movements produce a smoother bend in the corner, and as the notches are spaced apart, the inside radius grows.

An alternative method for forming the desired corner configurations of the plastic channel uses hot oil to facilitate bending the channel into corners. The plastic channel member may be dipped in hot oil at a temperature sufficient to temporarily decrease its rigidity. The plastic channel is then bent into the desired shape around the frame corners and connected to the frame as described above.

FIG. 13 shows an alternative design for the plastic channel member of the invention, which is configured to receive rounded instead of square cross-sectional frame members previously described. Similar to the plastic channel member of FIG. 7, in this embodiment the plastic channel is preferably made from exterior grade polyvinyl-chloride (PVC), which is extruded into the cross sectional shape shown in FIG. 13, and compounded with stabilizers for protection against ultra-violet radiation. Slot 160 defined by outer flange 161, base 162 and inner flange 163 is configured to receive the peripheral edge 9 portion of rebound member 11. The width of slot 60 is approximately equal to the thickness of rebound member 11 such that an interference fit is created between the rebound member and the extruded plastic member when the pieces are joined. Although not shown in FIG. 13, one or more of the flanges may be angled inwardly to increase the force created by the interference fit.

Slot 165 having a reverse "C" shaped cross section is defined by an arcuate wall 166 integrally extruded with inner flange 163. Slot 165 receives a portion of a frame having a rounded cross sectional shape that generally matches the cross section of circular slot 165. Slot 165 has an opening preferably extending about 145° to facilitate insertion of the rounded frame into the slot. The radius of slot 165 is approximately equal to or greater than the radius of the frame portion such that an interference fit is created between the plastic channel and the rounded frame portion as it is positioned in slot 165 and abuts the inner surface 167 of arcuate wall 166. The outer surface 168 of arcuate wall 166 includes a flat portion 170 on which an alignment groove 169 is formed. Similar to the FIG. 7 embodiment, to supplement or replace the interference fit the plastic channel may be detachably connected to the frame portion by way of a fastening structure, such as a self-tapping screw, positioned in alignment groove 169. The fastening structure extends through arcuate wall 166 and into the frame portion to secure the two pieces together. Similar to the FIG. 7 embodiment, the rebound member and frame portions are retained within slots 160 and 165 respectively, at a small clearance, which is preferably approximately equal to the thickness of inner flange 163.

Referring to FIG. 14, another alternative embodiment of the frame of the invention is shown and designated by reference numeral 250. This frame is substantially similar to the previous frame embodiments, however, it is formed from stamped steel or other materials of suitable strength and rigidity, such as thermoplastics or engineered plastic sheets, as opposed to welding several pieces of tubular steel members together. The advantages of the stamped steel frame are increased strength for supporting the rebound member, however the stamped steel method requires substantial investments in manufacturing equipment and tooling to perform the necessary processing steps. Although this alternative embodiment increases the strength and rigidity of the backboard assembly, it also adds cost and weight which may not be desirable in certain applications like these for portable support systems.

What is claimed is:

1. A basketball backboard comprising:

a rebound member having a rebound surface and a peripheral edge surrounding said rebound surface; and a support member including a plastic retainer and a frame, said retainer having a cross section defining a first slot configured to receive a portion of said frame and a second slot configured to receive at least a portion of said peripheral edge of said rebound member.

2. The basketball backboard of claim 1 wherein said retainer is connected to said frame portion by an interference fit.

3. The basketball backboard of claim 1 wherein said retainer is detachably connected to said frame by at least one fastening structure.

4. The basketball backboard of claim 2 wherein said retainer is detachably connected to said frame by at least one fastening structure.

5. The basketball backboard of claim 3 wherein said fastening structure includes at least one element selected from the group consisting essentially of self-tapping screws, molded snaps, and push-in fasteners.

6. The basketball backboard of claim 1 wherein said cross section of said retainer is defined by first, second and third wall members and a base, with said first, second and third wall members extending outwardly from said base, said third wall member disposed between said first and second



wall members, with said first slot being defined between said first and third wall members, and said second slot being defined between said second and third outer wall members.

7. The basketball backboard of claim 6 wherein said wall members and base define a generally E-shaped cross sectional shape.

8. The basketball backboard of claim 6 wherein at least one of said first and third outer wall members is angled toward each other.

9. The basketball backboard of claim 6 wherein at least one of said second and third wall members is angled toward each other.

10. The basketball backboard of claim 1 wherein said rebound member has front and rear faces, said rebound surface being defined on said front face.

11. The basketball backboard of claim 10 wherein said retainer is connected to said frame such that a clearance space is disposed between said rear face and said frame, said clearance space permitting limited flexing of said rebound member.

12. The basketball backboard of claim 11 wherein said clearance space is approximately equal to the thickness of said third wall member.

13. The basketball backboard of claim 11 further comprising padding material disposed in said clearance space to reduce the space between said rear face and said frame.

14. The basketball backboard of claim 1 wherein said retainer comprises a plurality of individual plastic pieces disposed around said periphery of said rebound member, each of said pieces coupling said rebound member to said frame by an interference fit in said second slot.

15. The basketball backboard of claim 14 wherein said retainer encapsulates substantially all of the peripheral edge of said rebound member.

16. The basketball backboard of claim 1 wherein said retainer comprises a single piece of plastic encapsulating the entire peripheral edge of said rebound member.

17. The basketball backboard of claim 16 wherein said retainer includes cut-out portions facilitating bending of said plastic piece.

18. The basketball backboard of claim 1 wherein said rebound surface is formed on a front surface of said rebound member, said retainer coupling said frame and said rebound member such that said front surface is substantially unobstructed by said retainer.

19. The basketball backboard of claim 1 wherein said rebound member comprises a substantially planar sheet of material formed from at least one material selected from the group consisting essentially of molded plastic, wood, laminate, tempered glass and metal, said retainer is formed from an extruded plastic material, and said frame is formed from steel having a tubular cross-section.

20. The basketball backboard of claim 1 wherein said frame is stamped from at least one material selected from the group consisting essentially of metal, thermoplastics, and engineered plastic sheets.

21. The basketball backboard of claim 1 wherein said frame includes an aperture formed in a rear surface of said frame, said aperture being configured to receive a fastener for mounting the backboard on a support system, said aperture being of predetermined length which is less than the thickness of the frame such that said fastener is isolated from said rebound member.

22. The basketball backboard of claim 1 wherein said frame comprises outer and inner support structures, with at least one of said support structures including a goal mounting portion for attaching a basketball goal thereto.

23. The basketball backboard of claim 22 wherein said outer support structure has a generally rectangular outer perimeter and said inner support structure comprises a bracing system connected to said outer support structure.

24. The basketball backboard of claim 23 wherein said bracing system comprises a generally "U" shaped beam and a plate connecting said outer support structure to said generally "U" shaped beam.

25. The basketball backboard of claim 23 wherein said bracing system comprises a pair of beams connected to opposed portions of said outer support structure.

26. The basketball backboard of claim 1 wherein said frame includes a rounded portion and said cross-section of said retainer is defined by first, second and third wall members and a base, with said first and second wall members extending outwardly from said base to define said first slot, said third wall member being integrally attached to said second wall member and having an arcuate-shaped opening configured to receive said rounded portion of said frame.

27. The basketball backboard of claim 26 wherein said retainer is connected to said frame by an interference fit and said rebound member is connected to said retainer by an interference fit.

28. The basketball backboard of claim 27 further comprising at least one fastening structure detachably connecting said retainer and said frame.

29. A basketball backboard assembly comprising:

a rebound member;

a frame for supporting the rebound member on a mounting structure; and

at least one plastic retainer coupling the rebound member to said frame.

30. The basketball backboard assembly of claim 29 wherein said rebound member has a peripheral edge, and said at least one retainer encapsulates substantially all of said peripheral edge.

31. The basketball backboard assembly of claim 29 wherein said rebound member has a peripheral edge and said at least one retainer encapsulates all of said peripheral edge.

32. A method of making a basketball backboard assembly from a rebound member, frame and plastic retainer, said method comprising the steps of:

(a) providing a rebound member having a rebound surface and a peripheral edge surrounding said rebound surface;

(b) providing a frame for supporting the rebound member;

(c) providing a plastic retainer having first and second slots;

(d) inserting at least a portion of said frame in the first slot; and

(e) inserting at least a portion of the peripheral edge of the rebound member within the second slot of said retainer.

33. The method of claim 32 further comprising the step of coupling the rebound member to the frame with the retainer to create a clearance space between the rebound member and the frame permitting limited flexing of the rebound member.

34. The method of claim 32 wherein the step of inserting the frame portion into the first slot creates a first interference fit that attaches the retainer to the frame such that the rebound surface is substantially unobstructed by said retainer.

35. The method of claim 34 further comprising the step of detachably connecting the frame and retainer together with at least one fastener.

36. The method of claim 32 further comprising the step of detachably connecting the frame and retainer together with at least one fastener.

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37. The method of claim 32 wherein the step of inserting at least a portion of the peripheral edge in the second slot provides an interference fit between the rebound member and the retainer.

38. The method of claim 32 wherein the step of providing a plastic retainer comprises providing a plurality of plastic retainers disposed around the periphery of the frame, and the step of inserting at least a portion of the peripheral edge of the rebound member within the second slot of the retainers encapsulates substantially all of the peripheral edge within the retainers.

39. The method of claim 32 wherein the step of inserting at least a portion of the peripheral edge of the rebound member within the second slot of the retainer comprises inserting all of the peripheral edge to completely encapsulate it within the retainer.

40. The method of claim 39 wherein said frame includes a curved portion defined by a first radius of curvature, and

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said step of inserting all of the peripheral edge in the second slot comprises bending the plastic retainer such that said retainer has a second radius of curvature that conforms to the first radius of curvature.

41. The method of claim 40 further comprising the step of subjecting the plastic retainer to hot oil to facilitate bending of the plastic retainer around the curved portion of the rebound member.

42. The method of claim 40 further comprising the step of creating at least one notch in the plastic retainer to facilitate bending of the plastic retainer.

43. The method of claim 32 wherein the step of providing a plastic retainer comprises extruding an exterior grade plastic including polyvinylchloride into a channel-shaped member.

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## Ichemco Web - Comparative Product Table

## Dow Corning® Silicone Pressure Sensitive Adhesives

Adhesive	TS %	Viscosity cps	Tack g	Peel g/in	Features
<b>Q2-7406</b>	56.5	20-80M	940	1500	Excellent high-temperature shear. Passes MIL Spec 23594C. Used for splicing and plating tapes.
<b>Q2-7735</b>	56.5	20-80M	1100	1600	Combines high tack and good adhesion. Premium release from liner coated with Syl-Off® Q2-7785 / Q2-7560 Release Coating.
<b>7358</b>	56.5	20-60M	1450	1400	High performance. High tack (including exceptional finger tack), good adhesion, 260°C (500°F) hold ability. Useful for electrical, plasma/flame-spray and high temperature masking tapes.
<b>7355</b>	56.5	20-60M	1275	1700	High performance. Exceptional adhesion, good tack. 260°C (500°F) hold ability. Useful for plating, masking and splicing tapes.
<b>Q2-7566</b>	56.5	30-90M	1060	1300	Excellent high-temperature stability. Passes MIL Spec 23594C. Used for electrical tapes and other very high-temperature tapes (up to 315°C / 600°F).
<b>7657 (Catalyst 4000)</b>	56.5	20-60M	1500	1500	Platinum catalyzed. Cures as low as 80°C (176°F). Releasable from liner coated with Syl-Off® Q2-7785 / Q2-7560 Release Coating. Useful on temperature-sensitive substrates. Useful for labels and transfer tapes.
<b>282</b>	56.5	25-80M	910	1600	High adhesion. Used for masking and plating tapes.
<b>280A</b>	56.5	25-80M	1080	1300	High tack. Passes MIL Spec 23594C. Used for masking and plating tapes.

*Average values; 40-50 µm (1.5-2.0 mils) of adhesive on PES film 50 50 µm (2.0 mils)*

All PSAs are supplied in xylene / toluene blend.

Tack is measured according to PolykenT method (trademark of The Kendall Company).

Adhesion is at 12 in / min. from stainless steel with 15-30 seconds dwell before testing. Thicker adhesive yields higher adhesion and tack.

Mod. DT2601E

First issued: 01-Mar-00

Version: 1

Revision: 01-Mar-00

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# Information About Specialty Materials for High Technology Applications

DOW CORNING

## DESCRIPTION

DOW CORNING® Q3-6093 silicone adhesive is a two-component, elastomeric adhesive and sealant with a variable cure rate and high modulus. Developed for a variety of high technology bonding, sealing and encapsulating applications, DOW CORNING Q3-6093 exhibits the following special features:

- Nonstumping (nonflowable) consistency
- Variable cure rate
- Ease of tooling
- Excellent unprimed adhesion to glass, metal and many other substrates
- Deep-section cure

## USES

DOW CORNING Q3-6093 silicone adhesive is designed for general adhering and bonding where excellent unprimed adhesion and deep-section cure are desired.

## HOW TO USE

### Mixing and Cure Properties

DOW CORNING Q3-6093 silicone adhesive is supplied as a 10:1 base-to-curing-agent kit, by weight. Lot matching of DOW CORNING Q3-6093 silicone adhesive base and curing agent is not necessary.

Before application, all substrates must be clean, dry and free of dirt, oil and other contaminants.

DOW CORNING Q3-6093 silicone adhesive curing agent should be stirred prior to use because some settling may occur during shipping and storage. The curing agent is reactive with atmospheric moisture so care should be exercised to limit exposure to air prior to use.

## DOW CORNING® Q3-6093 SILICONE ADHESIVE

Type	Two-part silicone elastomer
Physical Form as supplied	Flowable liquid
as cured	Flexible rubber
Special Properties	Variable cure rate with excellent unprimed adhesion; high modulus; good deep-section cure
Primary Use	Adhesive/sealant for a variety of high technology bonding, sealing and encapsulating applications

## TYPICAL PROPERTIES

These values are not intended for use in preparing specifications.

### As Supplied - Base

Color	White
Specific Gravity, at 25 C (77 F)	1.40

### As Supplied - Curing Agent

Color	Black
Specific Gravity, at 25 C (77 F)	1.03

### As Catalyzed\*

Color	Black
Specific Gravity	1.36
Working Time, minutes	15
Consistency	Nonstumping
Snap Time, minutes	25

### As Cured\*

ASTM D 412	Tensile Strength, psi	310
ASTM D 412	Elongation, percent	250
ASTM D 676	Durometer Hardness, Shore A, points	45
ASTM D 624	Tear Strength, Die B, pli	50
	Lap Shear Adhesion, psi	
	Aluminum	210
	Glass	210
	Heat Resistance, °C (°F)	150 (300)
ASTM D 150	Dielectric Constant	
	100 Hz	3.87
	100 kHz	3.73
ASTM D 150	Dissipation Factor	
	100 Hz	0.0121
	100 kHz	0.0055
ASTM D 257	Volume Resistivity, ohm-cm	1 × 10 <sup>14</sup>
ASTM D 149	Dielectric Strength, volts per mil	625

\*Mixed by weight at 10:1, base to curing agent, at 25 C (77 F).

\*At 25 C (77 F) for 7 days.

Specification Writers: Please contact Dow Corning Corporation, Midland, Michigan, before writing specifications on this product.

The base and curing agent should be thoroughly mixed using an airless mixing system. Commercial dispensing and mixing equipment is available from several manufacturers. Hand mixing and mechanical mixing may introduce air into the product, resulting in reduced physical properties.

To obtain optimum adhesion, joints should be tooled immediately after sealant application to insure complete substrate contact.

The cure rate for DOW CORNING Q3-6093 silicone adhesive may be varied by changing the base-to-curing-agent mix ratio from 8:1 to 14:1. This range of blend ratios offers snap times of from 15 to 60 minutes. See Figure 1.

During equipment shutdown it is recommended that the dispensing and mixing lines be purged with uncatalyzed base prior to solvent flush. This retards material build-up.

#### CAUTION

DOW CORNING Q3-6093 silicone adhesive curing agent and uncured catalyzed material will burn skin and eyes upon prolonged contact. In case of eye contact, flush with copious amounts of water for at least 15 minutes and seek medical attention at once. Skin contact areas should be washed with soap and water. Persistent irritation should receive medical attention. Use only with adequate ventilation; if not available, use respiratory protection.

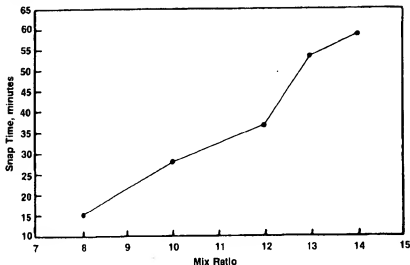
#### SHIPPING LIMITATIONS

None.

#### STORAGE AND SHELF LIFE

DOW CORNING Q3-6093 silicone adhesive base and curing agent should be stored in airtight closed containers. Shelf life is 12 months from date of shipment when stored at 25 C (77 F).

Figure 1: Cure Rate - Snap Time vs. Mix Ratio



#### MSDS INFORMATION

ATTENTION: PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED.

BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM YOUR DOW CORNING REPRESENTATIVE, OR DISTRIBUTOR, OR BY WRITING TO DOW CORNING CUSTOMER SERVICE, OR BY CALLING 1-517-496-6000.

#### WARRANTY INFORMATION - PLEASE READ CAREFULLY

Dow Corning believes that the information in this publication is an accurate description of the typical characteristics and/or uses of the product or products, but it is your

responsibility to thoroughly test the product in your specific application to determine its performance, efficacy and safety.

Unless Dow Corning provides you with a specific written warranty of fitness for a particular use, Dow Corning's sole warranty is that the product or products will meet Dow Corning's then current sales specifications. **DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR USE.** Your exclusive remedy and Dow Corning's sole liability for breach of warranty is limited to refund of the purchase price or replacement of any product shown to be other than as warranted, and Dow Corning expressly disclaims any liability for incidental or consequential damages.

**DOW CORNING CORPORATION**  
**MIDLAND, MICHIGAN 48686-0994**

"Dow Corning" is a registered trademark of Dow Corning Corporation.

FINA NO. 40017

**DOW CORNING**



US006056622A

**United States Patent** [19]**Chung**[11] **Patent Number:** **6,056,622**[45] **Date of Patent:** **May 2, 2000**[54] **BALLS WITH UNPREDICTABLE BOUNCE**[76] Inventor: **Chang I. Chung**, 2483 Whitehall Ct.,  
Schenectady, N.Y. 12309

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[21] Appl. No.: **08/490,435**[22] Filed: **Jun. 12, 1995****Related U.S. Application Data**

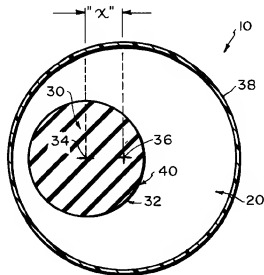
[63] Continuation of application No. 08/178,726, Sep. 7, 1993.

[51] **Int. Cl.<sup>7</sup>** ..... **A63H 17/00; A63B 37/00;**  
..... **A63B 37/10**[52] **U.S. Cl.** ..... **446/435; 473/594; 473/595**[58] **Field of Search** ..... **446/431, 437,**  
..... **446/486, 491; 273/DIG. 20, 58 F, 58 A,**  
..... **58 B, 58 BA, 58 H, 59 B, 60 B, 65 ED,**  
..... **29 R; 473/126, 591, 594, 595**[56] **References Cited****U.S. PATENT DOCUMENTS**

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**Primary Examiner—D. Neal Muir****Attorney, Agent, or Firm—Furgang & Adwar, LLP**[57] **ABSTRACT**

Unpredictable bounce characteristics are imparted to a ball by forming the ball as a composite wherein a second ball part is disposed within a first ball part with the centers of each ball part spaced one from the other. In a first embodiment the second ball part is of the relatively high bounce ball type that is disposed in a cavity formed in the first ball part which is fabricated from sponge-like rubber; with the second ball part center spaced from the first ball part center. In a second embodiment the first ball part is of the relatively high bounce ball type and the second ball part is an air filled cavity formed within the first ball parts with the center of the cavity spaced from the center of the first ball part. The composite balls may be formed by severing the first ball part, forming the cavity therein and either leaving the cavity empty or placing a second ball part of different characteristics than the first ball part within the cavity. A silicone glue is utilized to reassemble and secure the severed first ball part. Alternatively, gas can be injected into the first ball part while it is molded to form the empty cavity therein.

**11 Claims, 1 Drawing Sheet**

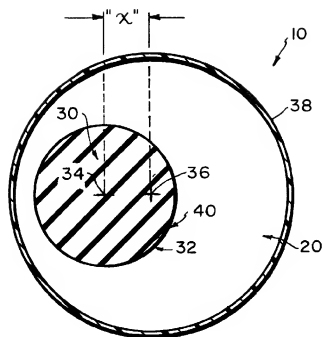


FIG. 1

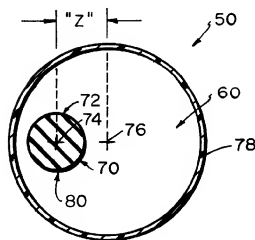


FIG. 2

**BALLS WITH UNPREDICTABLE BOUNCE**

This is a continuation of pending application Ser. No. 08/178,726 filed on Sep. 7, 1993.

**BACKGROUND OF THE INVENTION—FIELD OF APPLICATION**

This invention relates to balls utilized in playing and training for fun and sports activities; and more particularly to balls with unpredictable bounce characteristics.

**BACKGROUND OF THE INVENTION—DESCRIPTION OF THE PRIOR ART**

Ball playing is a common every day activity for adults as well as for children. Quite often the activity is carried out by two or more people throwing or bouncing the ball to each other. In many instances the child or adult plays with the ball by themselves; bouncing the ball on a nearby surface and catching the ball as it rebounds. The surface may be the ground or floor or it can be a wall, flight of steps or the like.

Catching re-bouncing balls may also be good practice for a person training for a sports activity such as baseball, softball or similar ball game. The person throws the ball against the wall or other surface and catches the ball on its rebound. There are even balls manufactured with characteristics that facilitate a training use by having their weight, size, shape and hardness varied to accommodate the desired training activity. Some training ball may even be fabricated to provide a significantly higher rebound characteristic than a regulation ball.

However, most balls and even training balls are symmetrically fabricated and provide a predictable bounce. The user can readily predict how the ball will bounce and the return flight path for the ball depending upon how and where they initially throw the ball. That predictability lessens the value to the player of the training activity. The predictability of the path of flight of a rebounding ball will also lessen the fun of merely playing with a ball possibly producing boredom and ending the play activity. An inability to predict and anticipate the return flight of a rebounding ball should increase the excitement and activity of playing with a ball and should result in a more difficult practice and improve fielding skills for a ball training activity.

Balls with unpredictable movement characteristics, purportedly to make play more interesting and exciting, are described and shown in United States and foreign patented literature. For example, U.S. Pat. No. 996,458 patented on Jun. 27, 1911 to A. R. Coleman for "Game Apparatus" shows and describes a number of different ball constructions but wherein the balls have only their rolling characteristics rendered unpredictable and then only when they are rolling in the proximity of one or more permanent magnets. The Coleman balls are hollow and are not constructed to be bounced. U.S. Pat. No. 3,106,397 patented on Oct. 8, 1963 to F. S. Lacey for "Ball Toy", on the other hand, provides a relatively complex ball construction requiring thrust members that, upon impact of the ball against a surface, project outwardly to direct the ball into an unpredictable flight path; providing what must be a relatively expensive and undesirable ball construction.

U.S. Pat. No. 454,544 patented on Jun. 23, 1891 to C. E. Goodspeed for "Loaded Toy Ball" shows and describes a ball with erratic movement characteristics but incorporated into a ball that is to be rolled and which is hollow and has a lead weight fixedly positioned against an inner surface of the hollow ball. F. C. Scholly, on the other hand, in his U.S.

Pat. No. 1,629,364 patented on May 17, 1927 for "Ball" provides a molded hollow ball with a weight molded in fixed disposition against an inner wall of the hollow ball but only for the purpose of facilitating the throwing of curved balls.

German patent 829,109 patented on Jan. 21, 1952 to F. Bartels provides a hollow ball with a weight suspended by straps; while U.S. Pat. No. 4,915,669 patented to G. K. Russell on Apr. 10, 1990 for "Ball With Swingable Internal Weight" provides a hollow air filled ball with a thin necked inner chamber to be filled with a substance other than air. However, air filled balls can be deflated and, as such, may not be acceptable especially for rigorous training practice.

W. O. Leslie in U.S. Pat. No. 4,986,540 patented on Jan. 22, 1991 for "Erratically Movable Inflated Game Ball" and German Publication DE 333-214-A of Oct. 31, 1984, both show hollow balls with a fluid inside occupying a relatively small amount of the hollow space and which is movable within the hollow space. Here again, such balls can be deflated and may not be suitable for the rigors of ball training activities. Alternatively, A. Prokapek in his U.S. Pat. No. 5,048,829 patented on Sep. 17, 1991 for "Amusement Ball" describes and shows a ball core covered by two figure "8" sections one of which is thicker than the other purportedly to provide unusual bounce and flight paths; but which may due to the irregularity of the surface, present undesirable grip characteristics.

**SUMMARY OF THE INVENTION**

It is therefore an object of this invention to provide new and novel balls.

It is another object of this invention to provide new and novel balls with unpredictable bounce characteristics.

It is yet another object of this invention to provide new and novel sports activity training balls.

It is still another object of this invention to provide new and novel sports activity training balls with unpredictable bounce characteristics.

It is a further object of this invention to provide new and novel play activity balls.

It is yet a further object of this invention to provide new and novel play activity balls with unpredictable bounce characteristics.

It is yet still a further object of this invention to provide new and novel composite balls wherein a first ball component is disposed within a second ball component.

It is yet still a further object of this invention to provide new and novel composite ball constructions wherein first ball components with first bounce characteristics are imbedded within second ball components with second bounce characteristics that are different than the first bounce characteristics.

Other objects, features and advantages of the invention in its details of construction and arrangement of parts will be seen from the above and from the following description of the preferred embodiments when considered with the drawing and from the appended claims.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In the drawing:

FIG. 1 is a schematic of a composite ball incorporating the instant invention; and

FIG. 2 is a schematic of an alternative construction of a composite ball also incorporating the instant invention.

**BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT**

With reference to FIG. 1 there is generally shown at 10 a composite ball incorporating the instant invention. A first



component or ball part 20 of composite ball 10 comprises a conventional sponge ball of the type that might be used to play, practice or train with for baseball. Ball part 20 is made of plastic foam material and is of a size and weight suitable and appropriate for the intended use. Ball 20, for example, may be 6.8 to 6.95 cm in diameter, 23.3 grams in weight and 0.137 gr/cc in density. While ball 20 has been described as being made from foam plastic and with the size, weight and density characteristics set out hereinabove other appropriate materials, sizes, weights and densities may be utilized. Ball 20 when dropped from 149 cm onto a marble floor rebounds at about 18 cm.

A second component or ball part 30 is imbedded within first ball part 20 at a location 32 such that the center 34 of ball part 30 is spaced from the center 36 of ball part 10 by a predetermined distance "x"; which, in this instance, is about one-third of the distance between center 36 of ball part 20 and the surface 38 of ball part 20 or as it may be otherwise stated one-third of the radius of ball part 20. Other distances may be selected for "x" as long as the centers 34 and 36 are not concentric. Ball part 30 comprises a conventional high bouncing type ball of the type that might also be utilized to play, practice or train with for baseball. Ball part 30 is made of an elastic rubber (silicone, thermoplastic elastomer, or the like) and is referred to as high bouncing because when dropped from a height of 149 cm onto a marble floor ball 30 will rebound at about 112 cm. Ball 30, for example, may be 3.7 cm in diameter, 24.5 grams in weight and 0.923 gr/cc in density. It should be understood that balls with other sizes, weights and densities and made from other materials could be utilized to form composite ball 10 as long as the balls for first ball part 20 are sufficiently larger than those utilized for second ball part 30 so that ball part 30 may be imbedded within ball part 20 and so that the ball parts initially possess different bounce characteristics.

One method for fabricating composite ball 10 would be to sever first ball part 20 at a location commensurate with where second ball part 30 is to be located. A cavity 40 equal to the size of second ball part 30 is then formed in first ball part 20. Second ball part 30 is then imbedded within first ball part 20 and first ball part 20 is then re-assembled and secured together so that ball part 30 is imbedded therewithin. In re-assembling first ball part 20 the parts thereof, that were severed to facilitate formation of cavity 40 and disposition of second ball part 30 therein, are secured together by suitable means such as a clear silicone glue of the type with a chemical composition methoxy polydimethylsiloxane that is left at least overnight to cure the glue at room temperature. Second ball part 30 may be also coated with such silicone glue, heavily if desired, prior to being placed within cavity 40.

Resulting composite ball 10, fabricated as described above, will bounce in unpredictable directions and to unpredictable heights; for example between 25 to 38 cm when dropped from the same 149 cm height onto the same marble floor as described above for first ball part 20 and second ball part 30.

Alternative methods of manufacture may be utilized for composite ball 10 including fabricating sponge ball part 20 with a high bouncing type ball part 30 disposed within sponge ball part 20 as sponge ball part 20 is formed.

With reference to FIG. 2 there is generally shown at 50 a composite ball also incorporating the instant invention. A first component or ball part 60, of composite ball 50, comprises a conventional ball of the high bouncing type, such as ball 30 of ball 10 of FIG. 1. Ball part 60 could thus

be of the same size, weight and density as ball 30 (i.e. 3.7 cm in diameter, 24.5 grams in weight and 0.923 gr/cc in density) and before being incorporated into composite ball 50 would display a bouncing height similar to ball part 30 if dropped from a height of 149 cm onto a marble floor (i.e. about 112 cm). Ball part 60 like ball part 30 could also be fabricated as a solid ball and from an elastic rubber such as silicone or thermoplastic elastomer.

A second ball part 70 is formed or disposed within first ball part 70 at a location 72 such that a center 74 for ball part 70 is spaced from a center 76 of first ball part 60 by a predetermined distance "Z"; which, in this instance, is about one-half of the distance between center 76 of first ball part 60 and a surface 78 of ball part 60, or as it may be otherwise stated one-half of the radius of ball part 60. Other distances may be selected for "Z" as long as centers 74 and 76 are not concentric.

Ball part 70 is formed as a spherical cavity or void 80 disposed within ball part 60 and located as described above. In doing so only about five percent of the weight of ball part 60 is removed. Ball part or void 70 may be formed with different non-spherical configurations and otherwise located within ball part 60. The final weight of composite ball 50 may be controlled by the volume of void or ball part 70. Thus, air serves as the material for ball part 70.

Composite ball 50 may be fabricated by severing ball part 60 at the appropriate position and by forming cavity or ball part 70 by suitable and conventional means and methods. The parts of ball part 60 are thereafter secured together by suitable and conventional means, such as an adhesive like clear silicone glue with a chemical composition, methoxy polydimethylsiloxane, which is thereafter allowed to cure about one day and at room temperature.

Resulting composite ball 50 will have unpredictable bouncing direction, a different and unpredictable rebound direction, and an unpredictable rebound height between 91 and 107 cm (when dropped from 149 cm onto a marble floor). While composite ball 50 is shown with only a single ball part or void 70 it may just as well be fabricated with multiple voids or ball parts 70.

An alternative method of fabricating composite ball 50 would utilize a gas-assisted injection molding process wherein a pressurized gas is injected inside the molten polymer during the molding of first ball part 60. The gas would be injected inside the molten polymer through the nozzle of the injection molder or through the mold before the molten polymer solidified inside the mold cavity. The injected gas creates void 70 and keeps the molten polymer pressed against the mold cavity wall during cooling. Undesirable shrinkage mark or warpage due to thermal shrinkage is avoided by this process even for thick parts. The size, shape and location of void 70 inside composite ball 50 can be controlled by the design and processing variables associated with this gas-assisted injection molding. The degree of unpredictability in the direction and height of rebound of composite ball 50 will be related to the size, shape and location of void or second ball part 70 within first ball part 60 of composite ball 50.

From the above description it will thus be seen that there has been provided new and novel composite balls for play and sports training activities; which composite balls are relatively simple in construction and to fabricate and will display unpredictable bouncing height and direction.

It is understood that although there has been shown and described preferred embodiments of the invention that various modifications may be made in the details thereof without departing from the spirit as comprehended by the following claims.

What is claimed is:

1. A composite resilient ball primarily for bouncing, comprising:

(a) first ball part means forming part of said composite resilient ball and having first resilient characteristics including a predetermined bounce characteristic; and

(b) second ball part means forming part of said composite resilient ball and having second resilient characteristics of which are different from said resilient characteristics of said first ball part means; and

(c) said second ball part means being disposed within said first ball part means, said second ball part means displaced away from the center of the first ball part means, so that the composite ball possesses at least unpredictable bounce characteristics.

2. The composite ball of claim 1 wherein said resilient characteristics of said first ball part means and said resilient characteristics of said second ball part means differ at least as to material, size and weight.

3. The composite ball of claim 2, wherein said second ball part means is disposed so that the center thereof is spaced a predetermined distance from the center of said first ball part means.

4. The composite ball of claim 3 wherein said first ball part means includes a periphery and said second ball part means is also spaced from said periphery of said first ball part means.

5. The composite ball of claim 4, wherein said predetermined distance is substantially one-third the length of the radius of said first ball part means.

6. The composite ball of claim 2, wherein said material of said first ball part means is a sponge rubber and the material of said second ball part means is an elastic rubber and wherein said first ball part means is of relatively larger diameter than the diameter of said first ball part means.

7. The composite ball of claim 6, wherein said material of said second ball part means is a silicone or thermoplastic elastomer.

8. The composite ball of claim 7, wherein said resilient characteristics of said second ball part means possesses relatively greater bounce characteristics than said first ball part means prior to combination thereof to form the composite ball.

9. The composite ball of claim 2, wherein said material of said first ball part means is an elastic rubber and the material of said second ball part means is air.

10. The composite ball of claim 9, wherein said center of said first ball part means and said center of said second ball part means are spaced by a predetermined distance which is substantially one-half the radius of said first ball part means.

11. The composite ball of claim 10, wherein said second ball part means comprises an air filled void formed within said first ball part means.

\* \* \* \* \*

[54] **WATER SPORT BOARD SAFETY TIP WITH ATTACHMENT FACILITATING EXTENSIONS**

[75] **Inventors:** David Skedelecki; Eric Arakawa, both of Aiea, Hi.

[73] **Assignee:** Surfco of Hawaii, Aiea, Hi.

[21] **Appl. No.:** 381,204

[22] **Filed:** Jul. 18, 1989

[51] **Int. Cl.:** A63C 15/05

[52] **U.S. Cl.:** 114/219; 441/74

[58] **Field of Search:** 114/219, 229, 126, 361; 280/608; 441/74, 65

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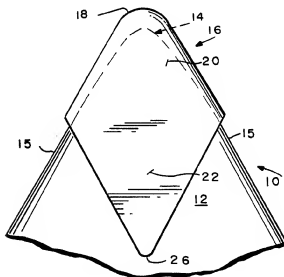
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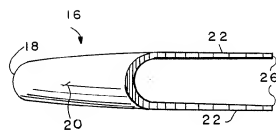
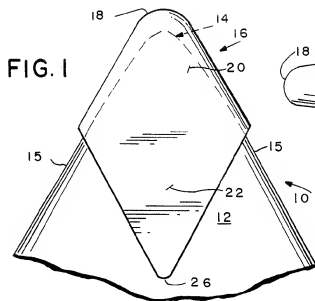
*Primary Examiner*—Joseph F. Peters, Jr.  
*Assistant Examiner*—Jesus D. Sotelo  
*Attorney, Agent, or Firm*—Nixon & Vanderhye

[57] **ABSTRACT**

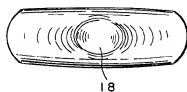
A protective tip cover for the sharply angled nose portion of a surfboard for reducing or preventing injury to a surfer or bystander upon impact with the nose portion of the board. Tip covers may be used for any type of surfboard, including those used for wind surfing. The cover comprises an integral relatively soft, resilient (e.g., silicone), member provided with a gently rounded apex portion, a main body portion, and upper and lower extensions. The extensions facilitate attachment of the tip cover to the upper and lower surfaces of the board, while providing the versatility to allow the safety tip to be used with a wide variety of different nose width and thickness boards.

**20 Claims, 1 Drawing Sheet**

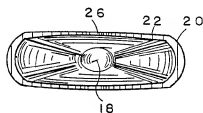




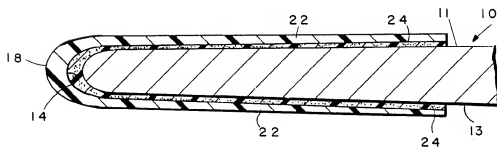
**FIG. 4**



**FIG. 3**



**FIG. 5**



# WATER SPORT BOARD SAFETY TIP WITH ATTACHMENT FACILITATING EXTENSIONS

## BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a safety device for water sport boards, to protect people using the boards or bystanders from injury should the tip of the board impact the user or bystander. The safety tip is a variation of that shown in our U.S. Pat. No. 4,792,316. The safety tip disclosed in that patent has been remarkably successful in the marketplace, and has gained wide acceptance in the industry. While it is an excellent and versatile product, for some water sport boards wider than conventional surfboards, or for surfboards that are thinner or thicker than conventional, the safety tip does not accommodate the boards quite to the extent desirable. A further modified form of that construction is disclosed in our co-pending patent application Ser. No. 07/287,975 filed Dec. 20, 1988, which is particularly useful in association with wind surfing boards. The revised construction of safety tip illustrated therein, because of its configuration, is essentially limited to wind surfing boards, and does not have broad versatility.

According to the present invention, a safety tip for a water sport board is provided that will accommodate wider, thinner, and thicker boards better than the design in our U.S. Pat. No. 4,792,316, and is applicable to all types of surfboards and the like, including—but not restricted to—wind surfing boards. The invention contains all of the same characteristics of the widely accepted protective tip of our U.S. Pat. No. 4,792,316 as far as protecting the surfers and bystanders, without adversely altering the performance characteristics of the board, are concerned. The material of which the safety tip according to the invention is made, and the general method of construction, are the same as for our patented tip, only the configuration of the tip being different.

According to the invention, there is provided in combination with a water sport board of the type having a sharply angled forward tip portion (including a top, bottom, and tapered sides) means for affording protection to the user of the board from injury upon contact with the tip portion, while not adversely altering the performance characteristics of the board. The protection affording means comprises an integral relatively soft, resilient plastic (preferably liquid injected silicone) tip cover, having a rounded exterior nose portion, a main body portion engaging the top, bottom, and tapered sides of the board, and upper and lower extension portions extending rearwardly from the body portion and engaging only the top and bottom of the board. The tip cover is fixedly secured to the tip portion of the board, for example by silicone adhesive between the body portion and the extension portions and the parts of the board that they overlay. The tip cover extension portions preferably taper to a point, and also preferably have a thickness decreasing slightly from the body portion to the pointed tip. The preferred material is liquid injected silicone having a durometer A hardness of about 35 to 40, a tensile strength of about 1,000–1,150 psi, and a tear resistance, Die B, of about 160–175 psi.

The invention also contemplates a protective tip cover for the forward tip of a water sport board which comprises a soft, resilient cushioning member for pro-

tecting the user of the board, the tip cover having been earlier described. Because of the construction of the tip cover, including the relatively short main body portion and with the upper and lower extensions which provide the primary mechanism for securing of the cover to the nose of the board, the tip cover according to the invention more easily accommodates wider, thinner, and thicker boards than the tip cover in our U.S. Pat. No. 4,792,316.

It is the primary object of the present invention to provide a versatile safety tip for water sport boards. This and other objects of the invention will become clear from an inspection of the detailed description of the invention and from the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of an exemplary safety tip according to the invention shown in use on a surfboard; FIG. 2 is a side elevational view of the tip of FIG. 1; FIG. 3 is a rear elevational view of the tip of FIG. 1; FIG. 4 is a front elevational view of the tip of FIG. 1; and

FIG. 5 is a detail cross-sectional view at the tip of the surfboard of FIG. 1.

## DETAILED DESCRIPTION OF THE DRAWINGS

A water sport board 10 according to the invention having a forward portion 12 ending in a pointed nose or tip 14 comprises—in the drawings—a contemporary short type surfboard. The invention is utilizable with any type of surfboard, or the like, however, including wind surfing type surfboards. The surfboard 10 has a top surface 11 (see FIG. 5), a bottom surface 13, and angled sides 15. A tip cover 16 according to the invention comprises means for protecting a surfer, or bystander, from the pointed tip 14 of the board should the board impact the surfer or bystander, without adversely affecting the performance characteristics of the surfboard 10.

The device 16 comprises a generally rounded exterior nose portion 18, integral with a main body portion 20, and upper and lower extension portions 22. The material of which the device 16 is made is a relatively soft, resilient plastic material, such as silicone material. The tip cover 16 is preferably produced by injection molding liquid injected silicone material which has a durometer A hardness of about 35–40, a tensile strength of about 1,000–1,150 psi, and a tear resistance, Die B, of about 160–175 psi.

As can be seen in FIGS. 1 and 5 in particular, the main body 20 of the tip cover 16 engages parts of the top 11, bottom 13, and tapered sides 15 of the surfboard 10, while the upper and lower extension portions 22 extend rearwardly from the body 20 and engage only the top 11 and bottom 13. The main body portion 20 is just large enough to completely cover and adhere to the tip 14 of the surfboard 10. For example the total length of the main body 20 along the tapered sides 15 from the point 14 would typically be about  $\frac{1}{2}$  of an inch to an inch and a half, whereas the widely accepted tip cover of our U.S. Pat. No. 4,792,316 typically would extend about two and a half inches along the tapered sides 15. Because the main body portion 20 covers only the tip 14, the tip cover 16 according to the invention is very versatile in accommodating water sport boards 10 of all different types of configurations. For example it can

accommodate boards 10 which are much wider, thinner, or thicker than normal, including virtually all conventional types of surfboards, including wind surfing surfboards.

In order to properly secure the tip cover 16 to the surfboard 10, the extensions 22 are provided. Without the extensions there would often be insufficient surface area inter-engagement between the tip cover 16 and the surfboard 10 to properly and positively hold it in place. The extensions 22, however, provide a much larger area for the application of adhesive 24 or the like. The tip cover 16 is most desirably held in place utilizing an adhesive 24 which extends the entire extent of the main body portion 20 and the extensions 22. The adhesive 24 must be compatible with the plastic material of which the tip cover 16 is made, e.g. a silicone adhesive when the tip cover 16 is of silicone.

In the embodiment illustrated in the drawings, the extensions 22 taper to and terminate in a point 26. The thickness of the main body 20 and extensions 22 are such that they become slightly, though consistently, thinner from the rounded nose 18 to the point 26. The exact configuration of the extensions 22, aside from being free of the tapering side edges 15, is not critical, it only being necessary that there be sufficient surface area so that proper attachment of the tip cover 16 to the board 10 is provided. The "diamond" shape configuration in the drawings is merely aesthetic.

The tip cover 16 can be applied to original manufactured surfboards, or it can be sold in a kit in the aftermarket, as described fully in our U.S. Pat. No. 4,792,316.

It will thus be seen that according to the invention a surfboard safety tip structure has been provided which is versatile in accommodating a wide variety of different types of water sport boards, yet provides a desired safety function without interfering with the performance characteristics of the board. While the invention has been herein shown and described in what is presently conceived to be the most practical and preferred embodiments, it will be apparent to those of ordinary skill in the art that many modifications may be made thereof within the scope of the invention, which scope is to be accorded the broadest interpretation of the appended claims so as to cover all equivalent structures, devices, and combinations.

What is claimed is:

1. In combination with a water sport board of the type having a sharply angled forward tip portion, including a top, bottom, and tapered sides; means for affording protection to the user of the board from injury upon contact with said tip portion while not adversely altering the performance characteristics of the board, said means comprising:

an integral relatively soft, resilient, plastic tip cover, having a rounded exterior nose portion;  
a main body portion engaging said tip, bottom, and tapered sides; and

upper and lower extension portions extending rearwardly from said body portion, past the rearwardmost point of said main body portion, and engaging only said top and bottom; said tip cover being fixedly secured to said tip portion of said board.

2. The combination as defined in claim 1 wherein said tip cover extension portions taper to a point.

3. The combination as defined in claim 1 wherein said tip cover is constructed of a liquid injected silicone material and wherein said tip cover is secured to said

board with silicone adhesive at said body portion and said extension portions.

4. The combination as defined in claim 3 wherein said tip cover has a durometer A hardness of about 35 to 40, a tensile strength of about 1,000-1,500 psi and a tear resistance, Die B, of about 160-175 psi.

5. The combination as defined in claim 1 wherein said tip cover is fixedly secured to said tip portion of said board by an adhesive at said body portion and said extension portions.

6. The combination as defined in claim 1 wherein said tip cover has a durometer A hardness of about 35 to 40, a tensile strength of about 1,000-1,500 psi and a tear resistance, Die B, of about 160-175 psi.

7. The combination as defined in claim 1 wherein said main body portion covers only the tip portion of the board so that said tip cover can accommodate a wide variety of widths, thicknesses, and configurations of boards.

8. The combination as defined in claim 7 wherein said main body portion extends no more than about one and one half inches along the tapered sides of said board.

9. The combination as defined in claim 8 wherein said main body portion extends about  $\frac{1}{4}$  of an inch along the tapered sides of said board.

10. The combination as defined in claim 8 wherein said tip cover is constructed of a liquid injected silicone material and wherein said tip cover is secured to said board with silicone adhesive at said body portion and said extension portions.

11. The combination as defined in claim 10 wherein said tip cover has a durometer A hardness of about 35 to 40, a tensile strength of about 1,000-1,500 psi and a tear resistance, Die B, of about 160-175 psi.

12. A protective tip cover for the forward tip of a water sport board, comprising a soft, resilient cushioning member for affording protection to the user of the board during surfing without adversely affecting the performance characteristics of the board, having a rounded exterior nose portion, a main body portion, and upper and lower extensions extending rearwardly from only a center portion of the main body portion, past the rearwardmost point of said main body portion, the main body portion adapted to engage the nose and sides, top and bottom of a water sport board, and the extensions adapted to engage only the top and bottom surfaces.

13. A protective tip cover as defined in claim 12 wherein said member is constructed of a liquid injected silicone material.

14. A protective tip cover as defined in claim 13 wherein said member has a durometer A hardness of about 35 to 40.

15. A protective tip cover as defined in claim 13 wherein said member has a tensile strength of about 1,000-1,150 psi and a tear resistance, Die B, of about 160-175 psi.

16. A protective tip cover as defined in claim 12 wherein said main body portion has an interior dimension adapted to engage the tapered sides of a board with which it is utilized along a length no greater than about one and one half inches.

17. A protective tip cover as defined in claim 16 wherein said member is constructed of a liquid injected silicone material.

18. A protective tip cover as defined in claim 17 wherein said member has a durometer A hardness of about 35 to 40.

19. A protective tip cover as defined in claim 17 wherein said member has a tensile strength of about 1,000-1,150 psi and a tear resistance, Die B, of about 160-175 psi.

20. A protective tip cover as defined in claim 12 5

wherein said main body portion has an interior dimension adapted to engage the tapered sides of a board with which it is utilized along a length about  $\frac{1}{4}$  of an inch.

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[54] SURFBOARD PROTECTIVE TIP

[76] Inventors: David Skedelski; Eric Arakawa,  
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96820

[21] Appl. No.: 37,190

[22] Filed: Apr. 10, 1987

[51] Int. Cl. A63C 15/05

[52] U.S. Cl. 441/74; 114/219

[58] Field of Search 114/219, 229; 441/74

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Primary Examiner—Sherman D. Basinger

Assistant Examiner—Thomas J. Braham

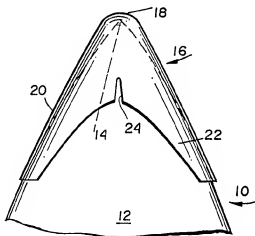
Attorney, Agent, or Firm—Nixon & Vanderhye

[57]

ABSTRACT

A protective tip cover for the sharply angled nose portion of a surfboard for reducing or preventing injury to the user upon impact with the nose portion of the board. The cover comprises a relatively soft, resilient (e.g., silicone), generally V-shaped member provided with a gently rounded apex portion and a pair of rearwardly extending wing portions which merge into side surfaces of the board. Upper and lower surfaces of the board are provided with slots extending from the juncture of the wing portions toward the apex. An after market kit is also provided for enhancing the safety of existing boards. The kit includes a surfboard tip cover, suitable primer and adhesive, applicators and installation instructions.

17 Claims, 1 Drawing Sheet





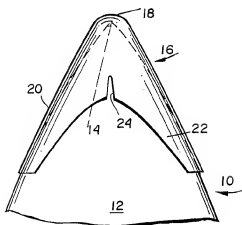


FIG. 1

FIG. 3

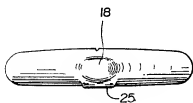


FIG. 2

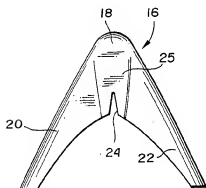


FIG. 5

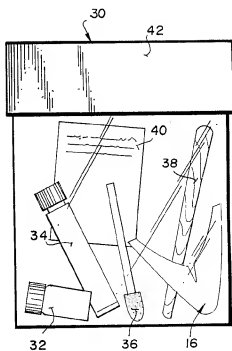
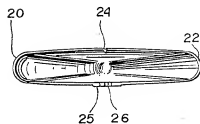


FIG. 4



## SURFBOARD PROTECTIVE TIP

## BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a safety device for surfboards, and specifically to a relatively soft protective covering member for the forward tip of a surfboard, and, in a related aspect, to a safety enhancing kit enclosing a protective tip cover along with suitable means for attaching the cover to a surfboard.

Contemporary short surfboards have sharply pointed forward tips which can seriously or fatally injure the user of the board upon loss of control of the board during surfing. Typically, after falling or being thrown from a board, the surfer is exposed to substantial danger from the board itself as the latter is tossed about by the enormous amount of energy generated by ocean waves. The hazard is made worse by the common practice of tying the board to the user's ankle to keep the board in the immediate area of the user, so that the board need not be located and retrieved after each so called "wipe-out".

Despite the obvious and substantial safety hazard presented by these contemporary boards, surfers have resisted attempts to make the boards safer through rounding of the tip or nose portion thereof. This invention provides an alternative safety measure which substantially retains the appearance and performance characteristics of the board, while providing a needed measure of safety for the user. In the present invention, a surfboard tip cover is provided which comprises a generally hollow, substantially V-shaped member which is made of a relatively soft, flexible and resilient silicone material. The device is adapted to fit over the sharply pointed boards and to present an only slightly rounded, yet effective cushion at the tip of the board. The V-shaped cover is further characterized in that notch-like slots are provided on upper and lower surfaces of the cover at the juncture between the main body or tip portion and rearwardly extending wing portions thereof which merge into the side surfaces of the board. These slots allow the device to be effectively applied to boards of slightly different sizes and shapes. The tip cover is designed to be permanently adhered to the tip of the surfboard through the use of suitable means such as silicone adhesive.

The tip cover itself is preferably made of a liquid injected silicone having a durometer A hardness of between about 35 and 40, a tensile strength of about 1150 psi and a tear resistance, Die B, of about pi 160. The rearwardly extending wing portions of the device are feathered along the inside edges thereof to insure smooth merging into the adjacent surfaces of the board.

A further aspect of the invention is the provision for a complete "after market" kit for increasing the safety of existing surfboards. The kit itself includes a tip cover of the type described above, adhesive means including a priming liquid and a silicone adhesive a primer applicator and an adhesive applicator. Also included in the kit may be suitable instructions for attaching the tip cover to the surfboard.

Further objects and advantages of the invention will become apparent from an inspection of the drawings and detailed description of the invention which follows.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the forward portion of a surfboard having a tip cover in accordance with this invention attached thereto;

FIG. 2 is a plan view of a tip cover in accordance with an exemplary embodiment of this invention, illustrating the side opposite that shown in FIG. 1;

FIG. 3 is a front view of the tip cover disclosed in FIG. 2;

FIG. 4 is a rear view of the tip cover disclosed in FIG. 2; and

FIG. 5 is a perspective view of a kit in accordance with the exemplary embodiment of this invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, there is illustrated a forward deck portion of a surfboard to which a tip cover in accordance with this invention has been attached. The surfboard 10 is of the contemporary, short type which typically includes a forward portion 12 having a sharply angled nose or tip 14. It is readily apparent that this sharply pointed nose or tip poses a significant safety hazard to anyone coming into contact with the board, either in the water or out. The board is particularly dangerous to the user upon loss of control of the board while surfing. The force of ocean waves propelling a board into contact with a momentarily defenseless user of the board can cause serious and even fatal injury.

The invention here relates to the attachment of a tip cover 16 to the tip 14 of the board 12. The cover has a generally V-shaped configuration wherein the apex of the V is gently rounded at 18. Legs or wing portions 20, 22 extend rearwardly from the apex portion 18 of the device.

As best seen in FIGS. 1 and 4, the tip cover 16 is substantially hollow, each of the rearwardly extending wing portions 20, 22 being formed with a generally trough-like shape so as to partially wrap around and merge into the side edges of the board.

At the juncture of the rearwardly extending wing portions, on both upper and lower surfaces of the cover, notch-like slots 24, 26 are provided to permit the cover to be fitted to boards of slightly different shapes and sizes. As best seen in FIG. 2, additional material may be added to the lower side of the cover in the form of a reinforced portion 25 extending from adjacent the slot 26 and merging into the nose area 18.

The tip cover is preferably constructed of a flexible and resilient liquid injected silicone, having a hardness on the durometer A scale of 35 to 40, a tensile strength of about 1,150 psi, and a tear resistance, Die B, of about pi 160.

The tip cover is preferably applied to the nose or top of a surfboard with a suitable adhesive. In this regard, it is to be understood that the tip of the surfboard need not fit all the way into the tip cover. In fact, pushing the tip into too far may cause distortion of the cover. It is preferable that any space left between the tip of the board and the apex of the cover be filled with the silicone adhesive to provide an even further cushioning effect.

In applying the tip cover to a sharply angled nose portion of a surfboard, it is necessary to first clean the nose area of the board of all wax, sand, dust, etc. It will be understood, of course, that any sharp or rough points on the tip of the surfboard should be removed, as by

sanding, etc. Once cleaned, a clear liquid primer is applied to the nose area of the board, and to the inside of the tip cover. Typical primers will dry in about one minute. It will be appreciated that the primer is necessary to promote adherence of the tip cover to the board. A suitable adhesive, such as a silicone glue is subsequently applied inside the tip cover and spread about the inside surface thereof with a suitable applicator. The tip cover is then pushed onto the tip of the board and any excess, exposed adhesive may be wiped away with a cloth or with the applicator. If desirable, masking tape may be used to hold the tip cover in place while the adhesive cures. Curing should be allowed to take place over approximately a twenty-four hour period.

Turning now to FIG. 5, there is illustrated an after market safety enhancing kit in accordance with another aspect of the invention. In FIG. 5, a substantially transparent plastic bag 30 is shown which encloses a tip cover 16 of the type described hereinabove, primer material 32, adhesive 34, a primer applicator 36, and an adhesive applicator 38. Promotional material 40 may also be enclosed if desired. The bag 30 may also be provided along its upper surface with a suitable closure 42, preferably of lightweight cardboard, which may include instructional material printed thereon, although an instruction sheet may be included as part of the promotional material 40 or as a separate sheet inserted in the bag if so desired.

It will thus be appreciated that the invention provides an effective measure of safety for otherwise hazardous surfboards in the form of a relatively inexpensive, and easily attached tip cover which serves to blunt or cushion the impact of the board and thereby reduce the chances of serious injury which might otherwise occur. The tip cover does not alter the overall appearance or performance characteristics of the board, and can be color matched or contrasted as desired.

While the invention has been described in connection with what is presently considered to be the most practical embodiment, it will be apparent to those of ordinary skill in the art that many changes and variations may be made which nevertheless remain within the spirit and scope of the appended claims.

What is claimed is:

1. In combination with a surfboard of the type having a sharply angled forward tip portion, means for affording protection to the user of the surfboard during surfing from injury upon contact with said tip portion while not altering the performance characteristics of the surfboard, said means comprising a relatively soft, resilient, silicone tip cover of generally V-shaped configuration, having a rounded exterior nose portion and rearwardly extending, substantially trough-shaped wing portions which intersect at a juncture defined by a pair of forwardly directed slots, said tip cover being fixedly secured to said tip portion of said surfboard.

2. A combination with a surfboard as recited in claim 1, said means for affording protection to the user consisting of said relatively soft, resilient tip cover of generally V-shaped configuration, and means for permanently affixing said tip cover to said tip portion of said surfboard.

3. The combination as defined in claim 1 wherein said tip cover is constructed of a liquid injected silicone material and wherein said tip cover is secured to said surfboard with silicone adhesive.

4. The combination as defined in claim 3 wherein said tip cover has a durometer A hardness of about 35 to 40,

a tensile strength of about 1150 psi and a tear resistance, Die B, of about pi 160.

5. The combination as defined in claim 3 wherein space between the said sharply angled tip portion of said surfboard and said rounded exterior nose portion of said cover is filled with said

6. A protective tip safety cover for the forward tip of a pointed tip surfboard comprising a soft, resilient generally V-shaped cushioning member for affording protection to the user of the surfboard during surfing having a rounded exterior nose portion at a center portion thereof and a pair of rearwardly extending substantially trough-shaped wing portions, said wing portions having edges which intersect at a juncture defined by slot means on upper and lower surfaces thereof extending from the juncture of said wing portions at said center portion toward said nose portion, and wherein each of said wing portions have a thickness which decreases toward said edges.

7. A protective tip cover as defined in claim 6 wherein said member is constructed of a liquid injected silicone material.

8. A protective tip cover as defined in claim 6 wherein said member has a durometer A hardness of about 35 to 40.

9. A protective tip cover as defined in claim 6 and wherein said tip cover is provided with a reinforced region spanning one of said slot means.

10. A kit for improving the safety of surfboards having sharply pointed forward tip portions, while not altering the performance characteristics of the surfboard, comprising:

- (a) means for affording protection to the user of the surfboard during surfing from injury upon contact with said tip portion while not altering the performance characteristics of the surfboard, said means comprising a relatively soft, resilient, silicone tip cover of generally V-shaped configuration, having a rounded exterior nose portion and rearwardly extending, substantially trough-shaped wing portions which intersect at a juncture defined by a pair of forwardly directed slots, said tip cover being fixedly secured to said tip portion of said surfboard;
- (b) adhesive means for attaching said protector to the tip of a surfboard; and
- (c) means for applying said adhesive means to said surfboard and said tip protector.

11. A kit as defined in claim 10 wherein said adhesive means comprises a primer and an adhesive.

12. A kit as defined in claim 11 wherein said adhesive comprises silicone adhesive.

13. A kit as defined in claim 10 wherein said member is constructed of a liquid injected silicone.

14. A kit as defined in claim 13 wherein said member has a durometer A hardness of about 35 to 40, a tensile strength of about 1,150 psi, and a tear resistance, Die B, of about psi 160.

15. A safety enhancing kit for use with surfboards of the type having sharply angled forward tip portions, while not altering the performance characteristics of the surfboard, comprising:

- (a) a relatively soft, resilient, and flexible liquid injected silicone tip cover for permanent attachment to the tip portion of a surfboard, said tip cover comprising a generally V-shaped cushioning member for affording protection to the user of the surfboard during surfing having a rounded exterior nose portion at a center portion thereof and a pair

- of rearwardly extending substantially trough-shaped wind portions, said wing portions having edges which intersect at a juncture defined by slot means on upper and lower surfaces thereof extending from the juncture of said wing portions at said center portion toward said nose portion, and wherein each of said wing portions have a thickness which decreases towards said edges;
- (b) primer means for preparing the surface of the broad for adhesively mounting said tip cover;
- (c) adhesive means for permanently securing said tip cover to said tip portion;
- (d) applicator means for said primer and said adhesive means; and
- (e) disposable enclosure means for holding elements (a) through (d).
16. A kit as defined in claim 15 wherein said tip cover has a durometer A hardness of about 35 to 40.
17. A kit as defined in claim 15 wherein said adhesive means comprises silicone adhesive.
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UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 4,792,316  
DATED : December 20, 1988  
INVENTOR(S) : David Skedelecki; Eric Arakawa

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2, line 31, "her" has been changed to --here--; line 44, "26" has been changed to --24--.

Column 3, line 42, "within", second occurrence, has been deleted; line 47, "surg-" has been changed to --surf--.

Column 4, line 34, "form" has been changed to --from--.

Column 5, line 2, "wind" has been changed to --wing--; line 11, "broad" has been changed to --board--.

**Signed and Sealed this  
Twentieth Day of February, 1990**

*Attest:*

JEFFREY M. SAMUELS

*Attesting Officer*

*Acting Commissioner of Patents and Trademarks*

- [54] **HOCKEY STICK**  
 [75] Inventor: **Allen R. Hankele**, Somerdale, N.J.  
 [73] Assignee: **Hankele Sports Enterprises, Inc.**,  
 Philadelphia, Pa.

[22] Filed: **Mar. 12, 1973**

[21] Appl. No.: **340,157**

- [52] U.S. Cl. .... 273/67 A  
 [51] Int. Cl. .... A63b 59/12  
 [58] Field of Search .... 273/26 R, 26 A, 26 B, 29 R,  
 273/29 A, 67 R, 67 A, 67 B, 72 R, 73 R, 95  
 R, 95 A, 96 R, 96 D

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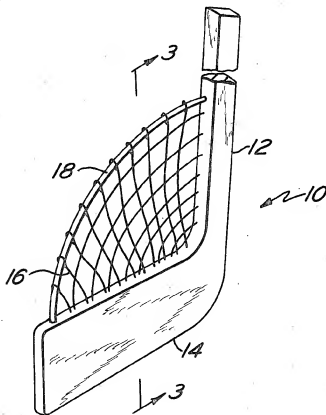
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2,042,984	6/1936	Fritz	273/67 R

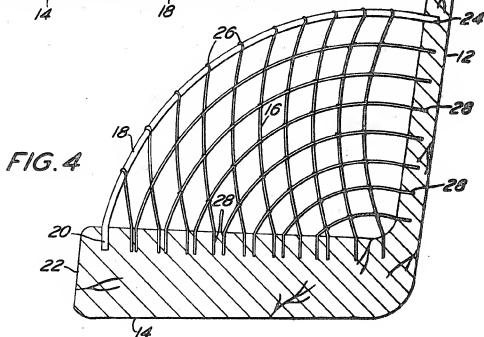
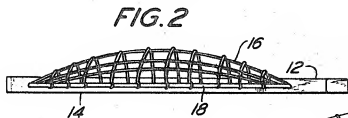
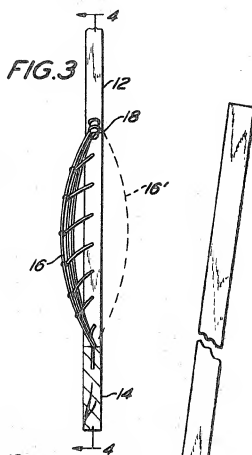
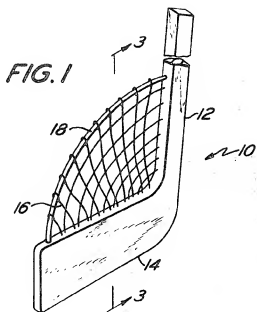
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### [57] ABSTRACT

A hockey stick comprising a handle and a blade which is integral therewith. The blade projects at an obtuse angle from the handle, thereby forming an elbow between the handle and the blade. A flexible net is secured in the elbow between the handle and blade.

6 Claims, 4 Drawing Figures





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**HOCKEY STICK**

This invention relates to a hockey stick, and more particularly, to a hockey stick that is adapted for use in street hockey and ice hockey.

Hockey is now becoming an increasingly popular sport in the United States. Its popularity as a spectator sport has led to the formation of many amateur and semiprofessional teams. With the advent of the popularity of the sport, it is also becoming a popular street game. Thus, many children are now playing street hockey using a plastic ball instead of a puck.

Through the years, various improvements have been made in hockey sticks. However, substantially all of these improvements have related to improvements in the blade of the stick. See, for instance, U.S. Pat. Nos. 3,677,542, 3,561,760, and 3,563,546. One improvement that has been made in a hockey stick is the provision of a rigid guard which is adapted to receive a puck in a receptacle in the blade to enable the player to carry the puck in the receptacle. This improvement is shown in U.S. Pat. No. 682,807.

The hockey stick of my invention also includes means for carrying a puck or ball when playing hockey. However, the device of my invention includes a flexible net which readily pivots from one side to the other side of the blade. Accordingly, the hockey stick is useable for both forehand and backhand shots. In the device of U.S. Pat. No. 682,807, the guard is rigid, and can be used only for forehand shots. Additionally, the guard is extremely small, and cannot be used in connection with the total length of the blade, but is only used in connection with a small portion of the blade. Thus, the guard is only adapted for use with highly skilled players and accordingly would be of little or no use to children or other people who play the game only on a part-time basis.

It is accordingly an object of this invention to provide a novel hockey stick.

It is another object of this invention to provide a hockey stick that includes a flexible net for catching and stopping a puck in both the forehand and backhand position.

These and other objects of this invention are accomplished by providing a hockey stick comprising a handle and a blade integral therewith, and a flexible net positioned over the blade and extending along substantially the entire length of the blade.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of the hockey stick of this invention;

FIG. 2 is a top plan view of the hockey stick of FIG. 1;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 1; and

FIG. 4 is an enlarged sectional view taken along the line 4—4 of FIG. 3.

Referring now in greater detail to the various figures of the drawings wherein like reference characters refer to like parts, a hockey stick embodying the present invention is generally shown at 10 in FIG. 1. Device 10 basically comprises a handle 12, a blade 14 and a net 16.

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The handle 12 and blade 14 are the elements of all hockey sticks. Thus, the blade 14 is integral with the handle 12 and projects at an obtuse angle therefrom, thereby forming an elbow. In the embodiment shown, as seen in FIG. 4, the blade and handle are unitary, and are formed from wood. However, the hockey stick of this invention is adapted to be formed from the same materials as any of the hockey sticks known to the art, including those where the blade is integrally attached to the handle. The stick can be formed from wood, aluminum, plastic or a combination of these materials.

A rod 18 extends across the elbow between the handle 12 and the blade 14. Rod 18 has one end 20 that is secured in a hole adjacent the toe 22 of blade 14. A second end 24 of the rod is secured in a hole in handle 12. The ends 20 and 24 are secured in place by a pressed fit, or if desired, an adhesive can be used to additionally secure the ends in place. Regardless of the method of securing, the rod 18 is rigidly secured in the blade and handle. Rod 18 can be formed from metal, such as aluminum or steel, or other rigid material.

The net 16 has an upper edge that is secured to the rod 18. This securing is accomplished by forming loops 25 of the top strands of the net, and adhesively securing these loops to the rod 18. The net also includes free ends 28 which are secured in holes in the handle 12 and blade 14. The free ends 28 are adhesively secured in place within the holes.

The net 16 can be formed from any durable webbing known to the art, such as rawhide or synthetic strands. Webs formed from nylon or polyester resins are particularly durable, and are adapted for use in this invention. The rod 18, the loops 26 and the ends 28 of the net 16 can be adhesively secured in place by any of the adhesives known to the art, such as epoxy or silicone adhesives.

One of the features of the hockey stick of this invention is the flexibility of the net 16. Thus, the hockey stick can be used in its normal manner in both forehand and backhand play. Whenever the puck or ball used in playing the game hits the blade 14 and bounces over the blade, it will be caught in the net 16. Since the hockey stick can be used in both forehand and backhand play, and since the net is flexible, the puck or ball will be caught regardless of whether a backhand or forehand shot is being attempted. Thus, as shown in FIG. 3, the net 16 will readily move from the position shown in full line in FIG. 3 to the position shown in phantom at 16' in FIG. 3 upon impact with an object.

It is thus seen that the hockey stick of this invention can be used where any of the hockey sticks have been used in the prior art. However, having the flexible net 16 renders the hockey stick much easier to use, especially when used in playing street hockey with a ball. Having the net 16 which will catch the puck or ball and aids in propelling the same will render the game far more exciting. New rules have been developed to encompass the carrying of a ball or puck within the net for a given period of time prior to the time that it must be shot from the net.

The hockey stick of this invention will also be an invaluable aid to new hockey players, who are not sufficiently adept at controlling or stopping a puck or ball solely with the blade 14. Since the net 16 is flexible, the hockey stick will be able to be used in all of the shots



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and motions which were usable with the prior art hockey sticks.

As best seen in FIG. 4, the net 16 extends over substantially the entire length of the blade 14. Additionally, it projects up a substantial portion of the handle 12. In this way, any puck or ball which bounces over the blade 14 will almost certainly be caught by the net.

Again referring to U.S. Pat. No. 682,807, it is seen that the guard used in connection with the blade extends only along approximately 30 percent of the length of the blade. Thus, it is quite possible that a puck, upon striking the blade, will hop over the small guard. Additionally, because the guard is rigid, it can be used only in connection with forehand shots. As pointed out above, the hockey stick of this invention has a net which extends along substantially the entire length of the blade, and in addition is flexible, enabling it to be used for both forehand and backhand shots.

Without further elaboration, the foregoing will so fully illustrate my invention, that others may, by applying current or future knowledge, readily adapt the same for use under various conditions of service.

What is claimed as the invention is:

1. A hockey stick comprising a handle and a blade integral therewith, said blade projecting at an obtuse angle from said handle, a rod having one end secured in said blade and another end secured in said handle, a flexible net suspended from said rod and having por-

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tions thereof secured to said blade and other portions thereof secured to said handle, whereby said net bridges the elbow between said blade and handle, said net extending along a substantial portion of the length of said blade, and said net being adhesively secured to said blade and said handle.

2. A hockey stick comprising a handle and a blade integral therewith, said blade projecting at an obtuse angle from said handle, a rod extending from a point adjacent the toe of said blade to a point along the length of the handle, said rod having one end secured in said blade adjacent said toe and the other end secured in said handle, a flexible net suspended from said rod and being secured to said blade and to said handle, said net extending along a substantial portion of the length of said blade, and said net being of sufficient length to permit it to pivot from one side of said blade and said handle to the other side of said blade and said handle upon impact.

3. The hockey stick of claim 2 wherein said rod is arcuate.

4. The hockey stick of claim 2 wherein said rod is rigid.

5. The hockey stick of claim 2 wherein said rods are adhesively secured in said blade and said handle.

6. The hockey stick of claim 5 wherein said net is adhesively secured to said blade and said handle.

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